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SRNL Preliminary Summary Report for Waste Isolation Pilot Plant (WIPP) Samples

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Background

The Savannah River National Laboratory (SRNL), Analytical Development (AD) section received high priority samples from the Waste Isolation Pilot Plant (WIPP) in New Mexico on May 8, 2014. The samples consisted of Masselin Cloth swipes, Radiological Control Operations (RCO) wipes, Fixed Air Sample (FAS) filter paper and Constant Air Monitor (CAM) filter papers in a cartridge. All these samples were taken from the Underground area around Panel 7 at WIPP. These were handled expediously and with the DOE Accident Investigation Board (AIB) oversight. The samples were unpackaged and photographed. All samples were first counted by Gamma Pulse Height Analysis (PHA) and then plans were devised and permission received from the WIPP, AIB and the DOE Carlsbad Field Office (CBFO) before proceeding with any analyses.

Executive Summary

Initial non-destructive gamma analyses conducted on the FAS sample indicated the airborne activity was primarily Am-241, followed by Pu-239, Am-243/Np-239, and Np-237/Pa-233.

The FAS sample was sectioned into 6 sections. One quarter section was sent to LANL for further analyses. One quarter section was archived. The remaining half was sectioned into 4 one eighth filter sections. One eight section was assayed by non-destructive Raman and x-ray fluorescence (XRF) techniques, and was then archived for further destructive radiochemical analysis techniques. One eight section was subjected to a water leach, and the leachate was assayed by ion-chromatography (IC) and by a total organic/total inorganic analysis (TIC/TOC). One eighth section was subjected to a mixed acid (aqua-regia) digestion; the dissolution was assayed by ICP-MS and ICP-ES analyses. One eight section was assayed by GC-MS.

The CAM filter housing was disassembled and each CAM filter was screened by gamma spectrometry. The first 6 CAM filters were white and had low levels of Am-241, the following 11 sample filters were black (with the exception of #13 which had no filter) and all had high levels of Am-241. Three CAM filters (#2, #7, and #11) were assayed further. Extended gamma assays on those CAM filters measured an actinide signature similar to what was found on the FAS. (CAM filters were removed from the cartridge in reverse order, see attachment 13 for clarification.)

The three CAM filters chosen for analysis were sectioned in a similar way. However, the one quarter was submitted for SEM and XRD particle analyses. XRF and Raman analyses were not conducted on the CAM filters. However, a portion of an eight section from CAM filter 2 was sampled for FTIR spectrometric analyses. The Raman analysis was inconclusive. The XRF analysis observed a number of elemental species, Pb, Na, and Cl among others. The XRD analysis could only identify particles of Sodium Chloride (NaCl). The SEM observed particles of NaCl as well as particles of Pb. The ICP-ES analysis observed Na, Mg, and Pb among other metals. The TIC/TOC analysis was inconclusive. The ion chromatography analysis identified Cl and well as nitrates and nitrites. The GC-MS analysis identified a high mass hydrocarbon (indicative of a viscous organic like a grease). The ICP-MS analysis measured a number of metals as well as the enrichment of the uranium (~5%) present in the samples. The ICP-MS analysis was also able to measure a Pu-240 enrichment (~7%) value. The FTIR observed a signature consistent with nitrated organics.

It is noted that the filter media used for sampling is not designed or optimized for organic compound recovery. The organic analytes captured may be under representative of analytes present in the air samples.

Future Plans for Sample Analysis

Further work planned involves completing the actinide characterization. Radiochemical analyses are planned for next week to measure Pu-241 concentrations as well as characterize any Cm-244 present. A peroxide fusion dissolution is planned for next week, potential exists for refractory actinides to be present in this sample that the aqua-regia dissolution did not digest, which could have an effect on the measured Pu isotopics particularly. Radiochemistry and ICP-MS will be conducted on this dissolution. ICP-ES will also be conducted to confirm the earlier aqua-regia analyses.

A more extensive IR analysis is planned for next week, various solvents will be used to selectively extract compounds from the CAM #2 matrix to see if compounds such as nitrocellulose are present in the air samples.

A higher resolution particle analysis Transmission Electron Microscopy (TEM) than the SEM will be conducted next week on the CAM sample to gain additional information on the particulates make-up of the contaminants on the air samples.

Gamma analyses will be conducted on the numerous masselins and wipes received since the initial set. Three of the RCO wipes received from the first set were analyzed with a number of methods, but not much was observed beyond low levels of Am-241 and NaCl.

Table of Analytical Data

Sample ID	LIMS#	Analyte	Chloride	Sulfate	Fluoride	Formate	Nitrite	Nitrate	Iodide	Magnesium	Sodium	Lead (ICP-ES)	Lead (ICP-MS)
		unit=microgram/wipe											
Wipe#1	300311088		2820	252									
Wipe#2	300311089		33700	892									
Wipe#3	300311091									358	327	<0.2	<0.5
Wipe#5	300311092									117	32	<0.2	<0.5
FAS	300311130									5420	4660	458	450
FAS	300311132		4510	2920	1030	667	197	474	<100				
CAM#2	300311196									420	5410	942	1000
CAM#2	300311192		3730	210	1160	512	1260	1170	353				
CAM#7	300311197									317	4320	700	700
CAM#7	300311193		4020	244	1130	851	1620	1320	410				
CAM#11	300311198									377	4880	671	700
CAM#11	300311194		3900	385	1480	1160	2240	474	<100				

Analytical Data Reports

Attachments:

1. **Radiological data report 5/18/14**
2. **Sample Preparation Narrative**
3. **Ion Chromatography**
4. **Carbon**
5. **Inductively Coupled Plasma Emission Spectrometry (ICP-ES)**
6. **Inductively Coupled Plasma Mass Spectrometry (ICP-MS)**
7. **Semivolatile Organic Compound analysis (SVOC)**
8. **Fourier Transform Infrared (FTIR) analysis**
9. **X-Ray Diffraction (XRD)**
10. **Scanning Electron Microscopy (SEM)**
11. **X-Ray Fluorescence (XRF)**
12. **Raman**
13. **Visual Observation of Filter Papers from FAS-118 and CAM-151**

Attachment 1

Report from DiPrete, 5/18/14 (reported to Curtis Chester, John Zimmerman and Mark Pearcy)

The results of the long gamma analyses on the 3 CAM samples is attached. Note Cs-137 has fallen off the observed list of isotopes from the FAS. It was a false positive from a minor gamma ray from Am-241. U-237 and Pu-241 are now also listed as bounding values in the FAS analysis. I'll have to run a radiochemical analysis to measure the Pu-241 activities in the bulk of the samples. Pu-241 was observed in the long count on CAM 11.

	Wipp FAS			
	Radioisotope	DPM/sample	1 Sigma %Unc	
	Be-7	4.72E+02	5%	
	K-40	4.35E+01	18.55%	
	Tl-208	2.10E+00	18.06%	
	Pb-212	2.79E+00	30.93%	
	Np-237/Pa-233	1.32E+01	9.57%	
	U-237	< 1.08E+02	upper limit	
	Np-239	3.14E+02	5%	
	Am-243	3.42E+02	5%	
	Pu-239	1.04E+05	7.29%	
	Am-241	2.74E+06	5%	
	Pu-241	< 4.42E+06	Calculated from U-237	
from ICP-MS	Th-232	1.79E-02		
	U-235	7.04E-01	(u-235 enrichment 5.54%)	
	U-238	1.87E+00		
	CAM Filter #2	ADS #300311040		
	Radioisotope	DPM/sample	1 Sigma %Unc	
	Pb-212	4.33E+00	31.03%	
	Np-237/Pa-233	2.44E+01	10.0%	
	NP-239	7.17E+02	10.0%	
	Am-243	7.58E+02	10.0%	
	Pu-239	4.12E+05	10.0%	
	Am-241	7.15E+06	10.0%	
	CAM Filter #7	ADS #300311045		
	Radioisotope	DPM/sample	1 Sigma %Unc	
	Pb-212	3.11E+00	32.38%	
	Np-237/Pa-233	2.75E+01	10.0%	
	NP-239	7.58E+02	10.0%	

	Am-243	7.46E+02	10.0%	
	Pu-239	3.72E+05	10.0%	
	Am-241	6.66E+06	10.0%	
	CAM Filter #11	ADS #300311049		
	Radioisotope	DPM/sample	1 Sigma %Unc	
	Np-237/Pa-233	2.90E+01	10.0%	
	NP-239	7.57E+02	10.0%	
	Am-243	6.52E+02	10.0%	
	Pu-239	4.80E+05	10.0%	
	Am-241	5.80E+06	10.0%	
	Pu-241	8.06E+05	20.40%	

Attachment 2

Sample Preparation Narrative

Hot De-ionized Water Treatments

The sample was weighed in a plastic weighing dish and then transferred to a thick-walled Teflon pressure vessel (CEM Corporation). Distilled and de-ionized water (15 mL) was added to the pressure vessel to cover the sample. The pressure vessel was capped using a motorized capping device and placed in a conventional drying oven. The vessel was heated at 115 °C overnight for a total time of approximately 16 hours. After cooling to room temperature, the solution was transferred to a 25 mL Pyrex volumetric flask and diluted to volume. A blank was carried out concurrently by adding only distilled and de-ionized water to a Teflon pressure vessel for heating.

- For the WIPP RCO wipe samples, the hot water treatment resulted in no significant amount of visible residual solids.
- For the Section C WIPP FAS sample, the hot water treatment did not dissolve the filter. Some very small black particles that also did not dissolve were removed by filtering the solution through a 0.45 micron pore size syringe filter before analysis of the hot water-soluble components. The blank solution was also passed through a clean filter.
- For the WIPP CAM filters, the hot water treatment did not dissolve the filter and there were a minimum of black particles (considerably less than for the WIPP FAS sample). No filtration step was performed on these solutions.

Hot HCl/HNO_3 Treatments

The sample was weighed in a plastic weighing dish and then transferred to a thick-walled Teflon pressure vessel (CEM Corporation). Concentrated HCl (6 mL) and concentrated HNO_3 (2 mL) was added to the pressure vessel to cover the sample. The pressure vessel was capped using a motorized capping device and placed in a conventional drying oven. The vessel was heated at 115 °C overnight for a total time of approximately 16 hours. After cooling to room temperature, the solution was transferred to a 25 mL Pyrex volumetric flask and diluted to volume.

- For the WIPP RCO wipe samples, the hot HCl/HNO_3 treatment resulted in no significant amount of visible residual solids.
- For the Section C WIPP FAS sample, the hot HCl/HNO_3 treatment dissolved the filter but some small black particles were visible. These particles removed by filtering the solution through a 0.45 micron pore size syringe filter before analysis of the hot acid-soluble components. The blank solution was also passed through a filter.
- For the WIPP CAM filters, the hot acid treatment appeared to dissolve the entire filter piece.

Attachment 3

Ion Chromatography

The first set of samples (300311087 – 300311089) were water leached and showed the presence of chloride and sulfate by Ion Chromatography. Table 1 below summarizes the results.

Table 1: Water leach of wipes.

		Fluoride	Formate	Chloride	Nitrite	Bromide	Nitrate	Phosphate	Sulfate	Oxalate
SPL ID	Cust ID	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe
300311087	Blank	<125	<125	50	<25	<25	<25	150	125	<25
300311088	Wipe #1	<125	<125	2820	<25	<25	<25	<25	252	<25
300311089	Wipe #2	<125	<125	33700	<25	<25	<25	<25	892	<25

The next set of samples (300311131 to 300311132 and 300311191 to 300311194) were water leached and the major analytes as shown in Table 2 were chloride, sulfate, nitrite, and nitrate. In addition, some samples contained iodide and trace amounts of bromide and acetate. Chromatograms of the samples with the blanks are shown in Figure 1.

Table 2: Water leach of CAM filters and Section C of WIPP FAS sample

		Fluoride	Acetate	Formate	Bromate	Chloride	Nitrite	Chlorate
SPL ID	CUST ID	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe
300311191	Blank	1080	<100	827	<100	<100	<100	<100
300311192	CAM #2	1160	141	512	<100	3730	1260	<100
300311193	CAM #7	1130	211	851	<100	4020	1620	<100
300311194	CAM #11	1480	264	1160	<100	3900	2240	<100
300311131	Blank	1270	<100	736	<100	199	111	<100
300311132	FAS	1030	<100	667	<100	4510	197	<100
		Bromide	Nitrate	Sulfate	Oxalate	Iodide	Perchlorate	Phosphate
		µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe	µg/wipe
300311191	Blank	<100	103	<100	<100	<100	<100	<100
300311192	CAM #2	<100	1170	210	<100	353	<100	<100
300311193	CAM #7	<100	1320	244	<100	410	<100	<100
300311194	CAM #11	<100	1640	385	<100	566	<100	<100
300311131	Blank	<100	<100	<100	<100	<100	<100	<100
300311132	FAS	156	474	2920	<100	<100	<100	<100

Figure 1: IC chromatograms of FAS (top) with blank and CAM (bottom) with blank

Attachment 4

Carbon

Aqueous leachate for the swipes was analyzed using an OI Analytical Aurora Total Carbon Analyzer. Inorganic carbon was measured by acidification of the aqueous leachate with 20% phosphoric acid which causes all inorganic carbon present to evolve as carbon dioxide gas. The evolved carbon dioxide is measured using infrared detection. Organic carbon was measured by warm sodium per sulfate chemical oxidation followed by infrared detection of the evolved carbon dioxide gas. Total carbon is calculated as the sum of the total inorganic carbon and the total organic carbon.

sample	tic (ug C/swipe)	toc (ug C/swipe)	tc (ug C/Swipe)
311087	115	1650	1770
311088	38.6	2500	2540
311089	210	2530	2740
311131	<1000	<1000	<2000
311132	<1000	<1000	<2000

sample	tic (ug C/swipe)	toc (ug C/swipe)	tc (ug C/Swipe)
311191	<1000	<1000	<2000
311192	<1000	3500	<4500
311193	<1000	4320	<5500
311194	1200	4760	5960

Attachment 5

Inductively Coupled Plasma Emission Spectroscopy (ICP-ES)

Inductively coupled plasma optical emission spectrometry (ICP-OES or ICP-ES)

- The inductively coupled plasma spectrometer provides multiple element analysis by measuring the light emitted when a liquid sample is desolvated, atomized, and excited by argon plasma. To accomplish the analysis, a liquid sample is introduced into a nebulizer where a small percentage, 2 to 4 percent, is turned into an aerosol. The aerosol is carried by an argon stream into the inductively coupled argon plasma (750-1500 watts) with a maximum temperature of 10,000 K. The aerosol is converted to atoms and ions which emit energy in the form of light.
- The light emitted is dispersed by an echelle grating and detected with a Charge-Induced-Device Detectors (CID) is used. Spectral data is transferred from the instrument, stored and analyzed on a data station computer.
- Multiple emission lines are used to quantitate each element, when available. During data analysis, those emission lines that show interference by the sample matrix are eliminated for the analysis, and the remaining calculated concentrations are averaged. Emission line interference may be positive or negative (suppression or elevated background subtraction).

Date report for RCO Wipes #3 and #5

USER_SAMPLEID:	ADS GENERATED BLANK		WIPE #3 (300311071)		WIPE #5 (300311073)	
SAMPLE_ID:	300311090		300311091		300311092	
UNITS:	ug/g		ug/g		ug/g	
Element						
Ag	< 1.42	(N/A %RSD)	< 1.33	(N/A %RSD)	< 1.41	(N/A %RSD)
Al	31	(11.3 %RSD)	57.8	(10.5 %RSD)	27.9	(12.8 %RSD)
B	< 20.5	(N/A %RSD)	20.1	(10.6 %RSD)	< 20.3	(N/A %RSD)
Ba	0.937	(97.7 %RSD)	1.04	(28.9 %RSD)	0.86	(4410 %RSD)
Be	< 0.105	(N/A %RSD)	< 0.098	(N/A %RSD)	< 0.104	(N/A %RSD)
Ca	476	(10 %RSD)	515	(10 %RSD)	313	(10 %RSD)
Cd	< 1.48	(N/A %RSD)	< 1.38	(N/A %RSD)	< 1.46	(N/A %RSD)
Ce	< 11.9	(N/A %RSD)	< 11.1	(N/A %RSD)	< 11.8	(N/A %RSD)
Co	< 2.52	(N/A %RSD)	< 2.35	(N/A %RSD)	< 2.49	(N/A %RSD)
Cr	< 1.42	(N/A %RSD)	2.09	(11.8 %RSD)	3.51	(11.4 %RSD)
Cu	< 2.9	(N/A %RSD)	< 2.71	(N/A %RSD)	< 2.86	(N/A %RSD)
Fe	35.9	(10 %RSD)	94.6	(10 %RSD)	70	(10 %RSD)
Gd	< 6.03	(N/A %RSD)	< 5.63	(N/A %RSD)	< 5.95	(N/A %RSD)
K	< 54.8	(N/A %RSD)	153	(14.4 %RSD)	< 54.1	(N/A %RSD)
La	< 1.5	(N/A %RSD)	< 1.4	(N/A %RSD)	< 1.48	(N/A %RSD)
Li	< 6.69	(N/A %RSD)	< 6.25	(N/A %RSD)	< 6.61	(N/A %RSD)
Mg	230	(10 %RSD)	17600	(10 %RSD)	6100	(10 %RSD)
Mn	1.88	(12.2 %RSD)	5.38	(10.3 %RSD)	2.78	(10.9 %RSD)
Mo	< 15.7	(N/A %RSD)	< 14.7	(N/A %RSD)	< 15.5	(N/A %RSD)
Na	358	(10.2 %RSD)	16100	(10.3 %RSD)	1660	(13.8 %RSD)
Ni	< 12.6	(N/A %RSD)	< 11.8	(N/A %RSD)	< 12.4	(N/A %RSD)
P	187	(10.1 %RSD)	65.8	(11.1 %RSD)	65.6	(10.3 %RSD)
Pb	< 10.3	(N/A %RSD)	< 9.65	(N/A %RSD)	< 10.2	(N/A %RSD)
S	< 1580	(N/A %RSD)	< 1480	(N/A %RSD)	< 1560	(N/A %RSD)
Sb	< 30.5	(N/A %RSD)	< 28.5	(N/A %RSD)	< 30.1	(N/A %RSD)
Si	263	(10 %RSD)	348	(10 %RSD)	222	(10.1 %RSD)
Sn	< 107	(N/A %RSD)	< 99.8	(N/A %RSD)	< 106	(N/A %RSD)
Sr	< 15.7	(N/A %RSD)	< 14.7	(N/A %RSD)	< 15.5	(N/A %RSD)
Th	< 10.1	(N/A %RSD)	< 9.39	(N/A %RSD)	< 9.93	(N/A %RSD)
Ti	< 4.43	(N/A %RSD)	< 4.13	(N/A %RSD)	< 4.37	(N/A %RSD)
U	< 103	(N/A %RSD)	< 95.8	(N/A %RSD)	< 101	(N/A %RSD)
V	< 0.748	(N/A %RSD)	< 0.748	(N/A %RSD)	< 0.739	(N/A %RSD)
Zn	3.69	(13.3 %RSD)	9.04	(10.2 %RSD)	4.56	(10.3 %RSD)
Zr	< 23.1	(N/A %RSD)	< 21.6	(N/A %RSD)	< 22.8	(N/A %RSD)

(Digestion factors for samples =49.2 and 52.1 respectively)

Data Report for CAM filters #2, 7, 11

USER_SAMPLEID:		ADS GENERATED BLANK		300311164_D(#2_311040)		300311170_D(#7_311045)		300311188_D(#11_311049)
SAMPLE_ID:		300311195		300311196		300311197		300311198
UNITS:		ug/filter disk		ug/filter disk		ug/filter disk		ug/filter disk
Element								
Ag		< 5.4	(N/A %RSD)	< 5.4	(N/A %RSD)	< 5.4	(N/A %RSD)	< 5.4	(N/A %RSD)
Al		< 100	(N/A %RSD)	< 100	(N/A %RSD)	< 100	(N/A %RSD)	< 100	(N/A %RSD)
B		< 77.9	(N/A %RSD)	< 77.9	(N/A %RSD)	< 77.9	(N/A %RSD)	< 77.9	(N/A %RSD)
Ba		< 2.8	(N/A %RSD)	< 2.8	(N/A %RSD)	< 2.8	(N/A %RSD)	< 2.8	(N/A %RSD)
Be		< 0.4	(N/A %RSD)	< 0.4	(N/A %RSD)	< 0.4	(N/A %RSD)	< 0.4	(N/A %RSD)
Ca		59.5	(10.1 %RSD)	167	(10 %RSD)	148	(10 %RSD)	205	(10 %RSD)
Cd		< 5.6	(N/A %RSD)	< 5.6	(N/A %RSD)	< 5.6	(N/A %RSD)	5.72	(16.8 %RSD)
Ce		< 45.3	(N/A %RSD)	< 45.3	(N/A %RSD)	< 45.3	(N/A %RSD)	< 45.3	(N/A %RSD)
Co		< 9.56	(N/A %RSD)	< 9.56	(N/A %RSD)	< 9.56	(N/A %RSD)	< 9.56	(N/A %RSD)
Cr		9.96	(10.2 %RSD)	8.4	(11.8 %RSD)	5.56	(15.2 %RSD)	10.4	(11.8 %RSD)
Cu		< 11	(N/A %RSD)	< 11	(N/A %RSD)	< 11	(N/A %RSD)	< 11	(N/A %RSD)
Fe		75.6	(10.2 %RSD)	33.7	(10.7 %RSD)	42	(11 %RSD)	92.2	(10.1 %RSD)
Gd		< 22.9	(N/A %RSD)	< 22.9	(N/A %RSD)	< 22.9	(N/A %RSD)	< 22.9	(N/A %RSD)
K		< 208	(N/A %RSD)	375	(30.8 %RSD)	274	(20.2 %RSD)	381	(23 %RSD)
La		< 5.68	(N/A %RSD)	< 5.68	(N/A %RSD)	< 5.68	(N/A %RSD)	< 5.68	(N/A %RSD)
Li		< 25	(N/A %RSD)	< 25.4	(N/A %RSD)	51.9	(33.4 %RSD)	< 25.4	(N/A %RSD)
Mg		176	(10 %RSD)	420	(10 %RSD)	317	(10 %RSD)	377	(10 %RSD)
Mn		< 3.64	(N/A %RSD)	< 3.64	(N/A %RSD)	< 3.64	(N/A %RSD)	< 3.64	(N/A %RSD)
Mo		< 59.7	(N/A %RSD)	< 59.7	(N/A %RSD)	< 59.7	(N/A %RSD)	< 59.7	(N/A %RSD)
Na		221	(13 %RSD)	5410	(10 %RSD)	4320	(10.1 %RSD)	4880	(10.1 %RSD)
Ni		< 47.8	(N/A %RSD)	< 47.8	(N/A %RSD)	< 47.8	(N/A %RSD)	< 47.8	(N/A %RSD)
P		< 142	(N/A %RSD)	< 142	(N/A %RSD)	< 142	(N/A %RSD)	< 142	(N/A %RSD)
Pb		< 39.2	(N/A %RSD)	942	(10 %RSD)	700	(10 %RSD)	671	(10 %RSD)
S		< 6000	(N/A %RSD)	< 6000	(N/A %RSD)	< 6000	(N/A %RSD)	< 6000	(N/A %RSD)
Sb		< 116	(N/A %RSD)	< 116	(N/A %RSD)	< 116	(N/A %RSD)	< 116	(N/A %RSD)
Si		284	(10.5 %RSD)	116	(11.1 %RSD)	194	(12.6 %RSD)	223	(10.3 %RSD)
Sn		< 406	(N/A %RSD)	< 406	(N/A %RSD)	< 406	(N/A %RSD)	< 406	(N/A %RSD)
Sr		< 59.6	(N/A %RSD)	< 59.6	(N/A %RSD)	< 59.6	(N/A %RSD)	< 59.6	(N/A %RSD)
Th		< 38.2	(N/A %RSD)	< 38.2	(N/A %RSD)	< 38.2	(N/A %RSD)	< 38.2	(N/A %RSD)
Ti		< 20	(N/A %RSD)	< 16.8	(N/A %RSD)	< 16.8	(N/A %RSD)	< 16.8	(N/A %RSD)
U		< 389	(N/A %RSD)	< 389	(N/A %RSD)	< 389	(N/A %RSD)	< 389	(N/A %RSD)
V		< 2.84	(N/A %RSD)	< 2.84	(N/A %RSD)	< 2.84	(N/A %RSD)	< 2.84	(N/A %RSD)
Zn		8.94	(14.7 %RSD)	14.9	(10.4 %RSD)	14.7	(11.7 %RSD)	16.9	(12 %RSD)
Zr		< 87.6	(N/A %RSD)	< 87.6	(N/A %RSD)	< 87.6	(N/A %RSD)	< 87.6	(N/A %RSD)

Data report on FAS

USER_SAMPLEID:	ADS GENERATED BLANK		300311038_D(311109)	
SAMPLE_ID:	300311129		300311130	
UNITS:	ug/smear		ur/smear	
Element				
Ag	< 10.8	(N/A %RSD)	< 10.8	(N/A %RSD)
Al	< 61.9	(N/A %RSD)	268	(11.8 %RSD)
B	< 156	(N/A %RSD)	< 156	(N/A %RSD)
Ba	< 5.6	(N/A %RSD)	< 5.6	(N/A %RSD)
Be	< 0.8	(N/A %RSD)	< 0.8	(N/A %RSD)
Ca	< 100	(N/A %RSD)	< 100	(N/A %RSD)
Cd	< 11.2	(N/A %RSD)	< 11.2	(N/A %RSD)
Ce	< 90.6	(N/A %RSD)	< 90.6	(N/A %RSD)
Co	< 19.1	(N/A %RSD)	< 19.1	(N/A %RSD)
Cr	< 20	(N/A %RSD)	< 20	(N/A %RSD)
Cu	< 22	(N/A %RSD)	< 22	(N/A %RSD)
Fe	122	(10.1 %RSD)	290	(10 %RSD)
Gd	< 45.8	(N/A %RSD)	< 45.8	(N/A %RSD)
K	< 416	(N/A %RSD)	< 416	(N/A %RSD)
La	< 11.4	(N/A %RSD)	< 11.4	(N/A %RSD)
Li	< 50.8	(N/A %RSD)	< 50.8	(N/A %RSD)
Mg	58.7	(10 %RSD)	5420	(10 %RSD)
Mn	< 7.28	(N/A %RSD)	7.4	(13.5 %RSD)
Mo	< 119	(N/A %RSD)	< 119	(N/A %RSD)
Na	< 349	(N/A %RSD)	4660	(10.1 %RSD)
Ni	< 95.6	(N/A %RSD)	< 95.6	(N/A %RSD)
P	< 284	(N/A %RSD)	< 284	(N/A %RSD)
Pb	< 78.4	(N/A %RSD)	458	(10.7 %RSD)
S	< 12000	(N/A %RSD)	< 12000	(N/A %RSD)
Sb	< 232	(N/A %RSD)	< 232	(N/A %RSD)
Si	< 155	(N/A %RSD)	700	(10.2 %RSD)
Sn	< 811	(N/A %RSD)	< 811	(N/A %RSD)
Sr	< 119	(N/A %RSD)	< 119	(N/A %RSD)
Th	< 76.3	(N/A %RSD)	< 76.3	(N/A %RSD)
Ti	< 33.6	(N/A %RSD)	< 33.6	(N/A %RSD)
U	< 779	(N/A %RSD)	< 779	(N/A %RSD)
V	< 5.68	(N/A %RSD)	< 5.68	(N/A %RSD)
Zn	< 50	(N/A %RSD)	< 50	(N/A %RSD)
Zr	< 175	(N/A %RSD)	< 175	(N/A %RSD)

Attachment 6

Inductively Coupled Plasma Mass Spectrometry (ICPMS)

Sample ID

ADS No.	Customer ID
300311090	ADS Generated Blank
300311091	Wipe #3 (300311071) - RPD wipe 3
300311092	Wipe #5 (300311073) - RPD wipe 5
300311129	ADS Generated Blank
300311130	300311038_D (311109) - WIPP FAS
300311195	ADS Generated Blank
300311196	300311164_D (#2_311040) - CAM filter 2
300311197	300311170_D (#7_311045) - CAM filter 7
300311198	300311188_D(#11_311049) - CAM filter 11

Discussion of Results

Nine samples were submitted for Inductively Coupled Plasma Mass Spectrometry (ICPMS) analysis. Results were converted to elemental concentrations based on natural abundance in this summary except for actinides. The RPD wipes contained trace levels (< 0.5 ug/wipe) Pb. The FAS contained Sr, Ga, Cd, Sn, Ba in the 1 - 5 ug/filter range, ~ 20 ug/filter Sb, and ~450 ug/filter Pb; enriched U was measured at ~ 2 ug/filter with lower levels of Pu239 and Am241 to be reviewed by David Diprete. The CAM filters contained ~ 5 ug/filter Cd for all filters, ~ 1000 ug/filter Pb for filter 2, and ~ 700 ug/filter Pb for filters 7 and 11. Enriched U was measured in the 3 - 5 ug/filter range for the CAM filters with lower levels of Pu239, Pu240, and Am241 to be reviewed by David Diprete. The FAS blank contained > 1 ug/filter Zr and Ag; the CAM blank contained > 1 ug/filter Co, Ag, and Sb.

Results:
Three data reports for RCO Wipes #3 and #5, FAS and CAM #2, #7 and #11

m/z	Opening Check Standard (ug/L)	--	300311090 ADS GENERATED BLANK 0.625 X ug/wipe	--	300311091 WIPE #3 (300311071) 0.625 X ug/wipe	--	300311092 WIPE #5 (300311073) 0.625 X ug/wipe	--	Closing Check Standard (ug/L)	--
51	1.00E+01	(6.75E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	9.97E+00	(1.45E+00 %RSD)
59	1.03E+01	(1.58E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.02E+01	(2.13E+00 %RSD)
69	5.61E+00	(2.02E-01 %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	5.57E+00	(1.69E+00 %RSD)
71	4.11E+00	(6.54E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	4.07E+00	(1.38E+00 %RSD)
78	2.40E+00	(1.17E+00 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.36E+00	(1.15E+00 %RSD)
84	5.94E-02	(7.71E+00 %RSD)	< 1.88E-02	(N/A %RSD)	< 1.88E-02	(N/A %RSD)	< 1.88E-02	(N/A %RSD)	5.90E-02	(9.15E+00 %RSD)
85	7.29E+00	(9.97E-01 %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	7.16E+00	(1.17E+00 %RSD)
86	1.01E+00	(8.45E-03 %RSD)	1.21E-01	(5.46E+00 %RSD)	2.41E-01	(3.92E-01 %RSD)	9.56E-02	(1.03E+01 %RSD)	1.01E+00	(4.12E-01 %RSD)
87	3.61E+00	(2.73E-01 %RSD)	9.45E-02	(2.71E+00 %RSD)	1.96E-01	(1.51E+00 %RSD)	7.41E-02	(6.53E-01 %RSD)	3.55E+00	(1.58E+00 %RSD)
88	8.27E+00	(6.82E-02 %RSD)	1.01E+00	(2.95E+00 %RSD)	2.04E+00	(9.20E-01 %RSD)	7.67E-01	(1.49E+00 %RSD)	8.10E+00	(1.38E+00 %RSD)
89	1.03E+01	(1.67E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.03E+01	(4.49E-01 %RSD)
90	5.04E+00	(1.58E-01 %RSD)	3.79E-01	(3.03E+01 %RSD)	2.28E-01	(1.46E+01 %RSD)	1.49E-01	(3.71E+00 %RSD)	4.83E+00	(2.55E-01 %RSD)
91	1.16E+00	(1.59E+00 %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	1.11E+00	(5.74E-02 %RSD)
92	3.13E+00	(3.62E-01 %RSD)	1.34E-01	(2.82E+01 %RSD)	8.69E-02	(4.54E+00 %RSD)	6.37E-02	(6.66E+00 %RSD)	3.07E+00	(2.44E-01 %RSD)
93	1.05E+01	(3.66E-01 %RSD)	< 5.63E-02	(N/A %RSD)	< 5.63E-02	(N/A %RSD)	< 5.63E-02	(N/A %RSD)	1.04E+01	(2.19E+00 %RSD)
94	2.65E+00	(2.49E-01 %RSD)	1.37E-01	(2.83E+01 %RSD)	8.62E-02	(2.85E+00 %RSD)	6.14E-02	(2.96E+00 %RSD)	2.58E+00	(1.60E+00 %RSD)
95	1.64E+00	(1.03E+00 %RSD)	< 1.88E-02	(N/A %RSD)	< 1.88E-02	(N/A %RSD)	< 1.88E-02	(N/A %RSD)	1.65E+00	(5.04E-01 %RSD)
96	2.52E+00	(1.27E-01 %RSD)	< 4.38E-02	(N/A %RSD)	< 4.38E-02	(N/A %RSD)	< 4.38E-02	(N/A %RSD)	2.52E+00	(1.51E+00 %RSD)
97	9.89E-01	(5.49E-02 %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	9.95E-01	(6.75E-01 %RSD)
98	2.64E+00	(8.03E-01 %RSD)	< 3.13E-02	(N/A %RSD)	< 3.13E-02	(N/A %RSD)	< 3.13E-02	(N/A %RSD)	2.63E+00	(1.03E+00 %RSD)
99	1.33E+00	(7.39E-02 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.34E+00	(3.08E+00 %RSD)
100	2.26E+00	(2.02E-01 %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	2.27E+00	(1.81E+00 %RSD)
101	1.73E+00	(5.43E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.75E+00	(1.93E+00 %RSD)
102	3.32E+00	(5.63E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	3.34E+00	(1.65E+00 %RSD)
103	1.04E+01	(1.53E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.06E+01	(2.34E+00 %RSD)
104	3.02E+00	(5.24E-01 %RSD)	< 3.13E-02	(N/A %RSD)	< 3.13E-02	(N/A %RSD)	< 3.13E-02	(N/A %RSD)	3.06E+00	(1.05E+00 %RSD)
105	2.26E+00	(2.22E-01 %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	2.27E+00	(1.36E+00 %RSD)
106	2.90E+00	(4.10E-01 %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	2.93E+00	(1.54E+00 %RSD)
107	5.41E+00	(4.10E-02 %RSD)	< 3.13E-02	(N/A %RSD)	< 3.13E-02	(N/A %RSD)	< 3.13E-02	(N/A %RSD)	4.97E+00	(5.55E+00 %RSD)
108	2.79E+00	(7.00E-01 %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	2.80E+00	(1.72E+00 %RSD)
109	5.00E+00	(2.36E-01 %RSD)	< 3.13E-02	(N/A %RSD)	< 3.13E-02	(N/A %RSD)	< 3.13E-02	(N/A %RSD)	4.57E+00	(5.52E+00 %RSD)
110	2.44E+00	(7.94E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.45E+00	(1.76E+00 %RSD)
111	1.33E+00	(2.60E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.34E+00	(8.11E-01 %RSD)
112	2.58E+00	(2.38E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.59E+00	(1.51E+00 %RSD)
113	1.39E+00	(1.85E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.39E+00	(3.25E+00 %RSD)
114	2.96E+00	(1.64E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.96E+00	(1.13E+00 %RSD)
116	2.14E+00	(1.28E+00 %RSD)	< 3.75E-02	(N/A %RSD)	< 3.75E-02	(N/A %RSD)	< 3.75E-02	(N/A %RSD)	2.16E+00	(9.05E-01 %RSD)
117	7.95E-01	(5.59E-01 %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	7.98E-01	(1.28E+00 %RSD)
118	2.44E+00	(9.24E-02 %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	2.44E+00	(1.61E+00 %RSD)
119	8.87E-01	(1.21E+00 %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	8.88E-01	(2.29E+00 %RSD)
120	3.29E+00	(2.91E-01 %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	3.31E+00	(6.88E-01 %RSD)
121	5.74E+00	(8.91E-02 %RSD)	< 3.75E-02	(N/A %RSD)	< 3.75E-02	(N/A %RSD)	< 3.75E-02	(N/A %RSD)	5.69E+00	(1.51E+00 %RSD)
122	7.42E-01	(7.69E-01 %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	7.41E-01	(2.51E+00 %RSD)
123	4.43E+00	(1.65E+00 %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	4.39E+00	(2.00E+00 %RSD)
124	1.09E+00	(1.04E+00 %RSD)	< 3.13E-02	(N/A %RSD)	< 3.13E-02	(N/A %RSD)	< 3.13E-02	(N/A %RSD)	1.08E+00	(1.16E+00 %RSD)
125	7.29E-01	(7.18E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	7.02E-01	(3.20E+00 %RSD)
126	1.98E+00	(1.33E+00 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.90E+00	(7.59E-01 %RSD)
128	3.27E+00	(1.15E+00 %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	3.15E+00	(1.16E+00 %RSD)
130	3.50E+00	(3.90E-01 %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	3.42E+00	(2.05E-01 %RSD)
133	1.06E+01	(1.26E+00 %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	1.06E+01	(1.57E+00 %RSD)
134	2.48E-01	(1.09E+00 %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	2.52E-01	(1.21E+00 %RSD)
135	6.76E-01	(1.12E+00 %RSD)	< 3.75E-02	(N/A %RSD)	< 3.75E-02	(N/A %RSD)	< 3.75E-02	(N/A %RSD)	6.83E-01	(1.06E+00 %RSD)
136	8.31E-01	(6.40E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	8.24E-01	(2.75E+00 %RSD)
137	1.15E+00	(8.53E-01 %RSD)	< 6.25E-02	(N/A %RSD)	< 6.25E-02	(N/A %RSD)	< 6.25E-02	(N/A %RSD)	1.15E+00	(2.24E-01 %RSD)
138	7.54E+00	(1.18E-01 %RSD)	2.95E-01	(2.50E+00 %RSD)	3.83E-01	(2.39E+00 %RSD)	2.82E-01	(1.46E+00 %RSD)	7.54E+00	(1.32E+00 %RSD)
139	1.06E+01	(7.58E-01 %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	< 2.50E-02	(N/A %RSD)	1.06E+01	(1.46E+00 %RSD)
140	9.24E+00	(7.62E-01 %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	9.32E+00	(8.37E-01 %RSD)
141	1.05E+01	(5.61E-01 %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	1.04E+01	(1.96E+00 %RSD)
142	4.02E+00	(3.15E-02 %RSD)	< 1.88E-02	(N/A %RSD)	< 1.88E-02	(N/A %RSD)	< 1.88E-02	(N/A %RSD)	3.90E+00	(5.75E+00 %RSD)
143	1.26E+00	(1.11E+00 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.26E+00	(1.99E+00 %RSD)
144	2.68E+00	(7.46E-01 %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	2.67E+00	(8.80E-01 %RSD)
145	8.58E-01	(4.08E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	8.55E-01	(1.05E+00 %RSD)
146	1.70E+00	(1.42E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.71E+00	(2.25E-01 %RSD)
147	1.50E+00	(1.13E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.49E+00	(6.79E-01 %RSD)
148	1.69E+00	(1.88E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.69E+00	(1.76E+00 %RSD)
149	1.38E+00	(4.10E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.39E+00	(7.97E-01 %RSD)
150	1.32E+00	(1.61E+00 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.34E+00	(1.37E+00 %RSD)
151	5.03E+00	(4.00E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	5.10E+00	(7.47E-01 %RSD)
152	2.70E+00	(1.68E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.72E+00	(7.16E-01 %RSD)
153	5.52E+00	(8.05E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	5.57E+00	(2.93E+00 %RSD)
154	2.50E+00	(8.83E-02 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.51E+00	(1.10E+00 %RSD)
155	1.47E+00	(4.65E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.49E+00	(1.66E+00 %RSD)
156	2.03E+00	(2.86E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.07E+00	(6.83E-01 %RSD)
157	1.55E+00	(6.51E-02 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.57E+00	(1.29E+00 %RSD)
158	2.49E+00	(2.00E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.53E+00	(1.85E+00 %RSD)
159	1.05E+01	(8.40E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.07E+01	(9.06E-01 %RSD)
160	2.42E+00	(8.61E-03 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.43E+00	(1.33E+00 %RSD)
161	1.82E+00	(1.90E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.87E+00	(1.54E+00 %RSD)
162	2.46E+00	(5.50E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.50E+00	(1.38E+00 %RSD)
163	2.40E+00	(8.18E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.47E+00	(1.18E+00 %RSD)
164	3.03E+00	(9.68E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.96E+00	(9.58E-01 %RSD)
165	1.02E+01	(6.89E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.04E+01	(1.81E+00 %RSD)
166	3.48E+00	(1.72E+00 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	3.56E+00	(1.17E+00 %RSD)
167	2.26E+00	(7.95E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.30E+00	(8.65E-01 %RSD)
168	2.67E+00	(7.14E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.75E+00	(9.70E-01 %RSD)
169	1.02E+01	(5.46E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.06E+01	(2.71E-01 %RSD)
170	1.76E+00	(1.36E+00 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.81E+00	(1.50E+00 %RSD)
171	1.38E+00	(6.85E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.42E+00	(1.48E+00 %RSD)
172	2.11E+00	(9.00E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	2.17E+00	(7.40E-01 %RSD)
173	1.54E+00	(1.01E+00 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.61E+00	(1.48E+00 %RSD)
174	3.24E+00	(5.07E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	3.37E+00	(1.49E+00 %RSD)
175	9.92E+00	(7.01E-01 %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	< 6.25E-03	(N/A %RSD)	1.02E+01	(1.58E+00 %RSD)
176	1.97E+00	(2.56E-01 %RSD)	< 1.88E-02	(N/A %RSD)	< 1.88E-02	(N/A %RSD)	< 1.88E-02	(N/A %RSD)	2.02E+00	(1.55E+00 %RSD)
177	1.77E+00	(9.61E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.75E+00	(7.51E-01 %RSD)
178	2.70E+00	(5.37E+00 %RSD)	< 1.88E-02	(N/A %RSD)	< 1.88E-02	(N/A %RSD)	< 1.88E-02	(N/A %RSD)	2.59E+00	(3.05E-01 %RSD)
179	1.29E+00	(8.92E-01 %RSD)	< 3.75E-02	(N/A %RSD)	< 3.75E-02	(N/A %RSD)	< 3.75E-02	(N/A %RSD)	1.28E+00	(5.19E-02 %RSD)
180	3.54E+00	(9.09E-03 %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	< 9.38E-02	(N/A %RSD)	3.62E+00	(5.48E-01 %RSD)
181	1.01E+01	(6.73E-01 %RSD)	< 6.25E-02	(N/A %RSD)	< 6.25E-02	(N/A %RSD)	< 6.25E-02	(N/A %RSD)	1.04E+01	(1.40E+00 %RSD)
182	2.53E+00	(1.91E-01 %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	< 1.25E-02	(N/A %RSD)	2.58E+00	(1.30E-01 %RSD)

m/z	Opening Check Standard (ug/L)	--	300311129 ADS GENERATED BLANK 23.1481 X ug/filter	--	300311130 300311038_D(311109) 17.8571 X ug/filter	--	Closing Check Standard (ug/L)	--
51	1.00E+01	(6.75E-01 %RSD)	5.99E-01	(4.23E+00 %RSD)	2.26E+00	(4.33E+00 %RSD)	9.97E+00	(1.45E+00 %RSD)
59	1.03E+01	(1.58E+00 %RSD)	3.19E-01	(3.87E-01 %RSD)	4.47E-01	(1.95E+00 %RSD)	1.02E+01	(2.13E+00 %RSD)
69	5.61E+00	(2.02E-01 %RSD)	< 1.00E-01	(N/A %RSD)	1.97E+00	(4.37E+00 %RSD)	5.57E+00	(1.69E+00 %RSD)
71	4.11E+00	(6.54E-01 %RSD)	< 5.00E-02	(N/A %RSD)	1.25E+00	(2.25E+00 %RSD)	4.07E+00	(1.38E+00 %RSD)
78	2.40E+00	(1.17E+00 %RSD)	< 7.50E-02	(N/A %RSD)	< 7.50E-02	(N/A %RSD)	2.36E+00	(1.15E+00 %RSD)
84	5.94E-02	(7.71E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	5.90E-02	(9.15E+00 %RSD)
85	7.29E+00	(9.97E-01 %RSD)	< 5.00E-02	(N/A %RSD)	5.40E-01	(4.90E-01 %RSD)	7.16E+00	(1.17E+00 %RSD)
86	1.01E+00	(8.45E-03 %RSD)	< 5.00E-02	(N/A %RSD)	3.87E-01	(4.32E-01 %RSD)	1.01E+00	(4.12E-01 %RSD)
87	3.61E+00	(2.73E-01 %RSD)	< 5.00E-02	(N/A %RSD)	5.09E-01	(3.24E+00 %RSD)	3.55E+00	(1.58E+00 %RSD)
88	8.27E+00	(6.82E-02 %RSD)	1.97E-01	(6.26E+00 %RSD)	3.28E+00	(1.15E+00 %RSD)	8.10E+00	(1.38E+00 %RSD)
89	1.03E+01	(1.67E-01 %RSD)	< 1.00E-01	(N/A %RSD)	2.31E-01	(8.23E+00 %RSD)	1.03E+01	(4.49E-01 %RSD)
90	5.04E+00	(1.58E-01 %RSD)	1.49E+00	(3.25E+00 %RSD)	5.75E-01	(3.52E+00 %RSD)	4.83E+00	(2.55E-01 %RSD)
91	1.16E+00	(1.59E+00 %RSD)	3.37E-01	(8.85E-01 %RSD)	1.41E-01	(1.15E+00 %RSD)	1.11E+00	(5.74E-02 %RSD)
92	3.13E+00	(3.62E-01 %RSD)	6.32E-01	(1.68E-01 %RSD)	3.77E-01	(3.81E-02 %RSD)	3.07E+00	(2.44E-01 %RSD)
93	1.05E+01	(3.66E-01 %RSD)	6.03E-01	(7.07E-01 %RSD)	6.64E-02	(1.90E+01 %RSD)	1.04E+01	(2.19E+00 %RSD)
94	2.65E+00	(2.49E-01 %RSD)	6.03E-01	(2.02E-01 %RSD)	3.14E-01	(2.79E+00 %RSD)	2.58E+00	(1.60E+00 %RSD)
95	1.64E+00	(1.03E+00 %RSD)	2.50E-01	(N/A %RSD)	< 2.50E-01	(N/A %RSD)	1.65E+00	(5.04E-01 %RSD)
96	2.52E+00	(1.27E-01 %RSD)	2.63E-01	(2.71E+00 %RSD)	2.47E-01	(1.10E-01 %RSD)	2.52E+00	(1.51E+00 %RSD)
97	9.89E-01	(5.49E-02 %RSD)	1.25E-01	(N/A %RSD)	< 1.25E-01	(N/A %RSD)	9.95E-01	(6.75E-01 %RSD)
98	2.64E+00	(8.03E-01 %RSD)	2.64E-01	(1.97E+00 %RSD)	3.06E-01	(1.75E+00 %RSD)	2.63E+00	(1.03E+00 %RSD)
99	1.33E+00	(7.39E-02 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.34E+00	(3.08E+00 %RSD)
100	2.26E+00	(2.02E-01 %RSD)	< 1.25E-01	(N/A %RSD)	< 1.25E-01	(N/A %RSD)	2.27E+00	(1.81E+00 %RSD)
101	1.73E+00	(5.43E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.75E+00	(1.93E+00 %RSD)
102	3.32E+00	(5.63E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	3.34E+00	(1.65E+00 %RSD)
103	1.04E+01	(1.53E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.06E+01	(2.34E+00 %RSD)
104	3.02E+00	(5.24E-01 %RSD)	< 2.50E-01	(N/A %RSD)	< 2.50E-01	(N/A %RSD)	3.06E+00	(1.05E+00 %RSD)
105	2.26E+00	(2.22E-01 %RSD)	4.06E-01	(1.66E+01 %RSD)	4.36E-01	(2.09E+01 %RSD)	2.27E+00	(1.36E+00 %RSD)
106	2.90E+00	(4.10E-01 %RSD)	5.11E-01	(1.96E+01 %RSD)	5.75E-01	(1.83E+01 %RSD)	2.93E+00	(1.54E+00 %RSD)
107	5.41E+00	(4.10E-02 %RSD)	2.00E+00	(9.86E+00 %RSD)	1.87E+00	(1.72E+01 %RSD)	4.97E+00	(5.55E+00 %RSD)
108	2.79E+00	(7.00E-01 %RSD)	4.84E-01	(1.78E+01 %RSD)	5.40E-01	(2.06E+01 %RSD)	2.80E+00	(1.72E+00 %RSD)
109	5.00E+00	(2.36E-01 %RSD)	1.83E+00	(7.91E+00 %RSD)	1.76E+00	(1.65E+01 %RSD)	4.57E+00	(5.52E+00 %RSD)
110	2.44E+00	(7.94E-01 %RSD)	2.73E-01	(1.30E+01 %RSD)	6.97E-01	(7.49E+00 %RSD)	2.45E+00	(1.76E+00 %RSD)
111	1.33E+00	(2.60E-01 %RSD)	< 5.00E-02	(N/A %RSD)	6.08E-01	(1.91E+00 %RSD)	1.34E+00	(8.11E-01 %RSD)
112	2.58E+00	(2.38E-01 %RSD)	< 5.00E-02	(N/A %RSD)	1.17E+00	(3.40E+00 %RSD)	2.59E+00	(1.51E+00 %RSD)
113	1.39E+00	(1.85E-01 %RSD)	< 5.00E-02	(N/A %RSD)	6.82E-01	(6.05E+00 %RSD)	1.39E+00	(3.25E+00 %RSD)
114	2.96E+00	(1.64E-01 %RSD)	< 5.00E-02	(N/A %RSD)	1.39E+00	(2.58E-01 %RSD)	2.96E+00	(1.13E+00 %RSD)
116	2.14E+00	(1.28E+00 %RSD)	< 1.00E-01	(N/A %RSD)	4.45E-01	(4.33E-01 %RSD)	2.16E+00	(9.05E-01 %RSD)
117	7.95E-01	(5.59E-01 %RSD)	< 5.00E-02	(N/A %RSD)	9.82E-02	(1.99E+00 %RSD)	7.98E-01	(1.28E+00 %RSD)
118	2.44E+00	(9.24E-02 %RSD)	< 1.50E-01	(N/A %RSD)	2.98E-01	(1.61E+00 %RSD)	2.44E+00	(1.61E+00 %RSD)
119	8.87E-01	(1.21E+00 %RSD)	< 5.00E-02	(N/A %RSD)	1.25E-01	(4.38E+00 %RSD)	8.88E-01	(2.29E+00 %RSD)
120	3.29E+00	(2.91E-01 %RSD)	< 2.00E-01	(N/A %RSD)	3.98E-01	(4.06E-01 %RSD)	3.31E+00	(6.88E-01 %RSD)
121	5.74E+00	(8.91E-02 %RSD)	< 1.00E-01	(N/A %RSD)	1.03E+01	(3.24E-01 %RSD)	5.69E+00	(1.51E+00 %RSD)
122	7.42E-01	(7.69E-01 %RSD)	< 5.00E-02	(N/A %RSD)	8.70E-02	(4.18E+00 %RSD)	7.41E-01	(2.51E+00 %RSD)
123	4.43E+00	(1.65E+00 %RSD)	< 1.00E-01	(N/A %RSD)	7.90E+00	(7.30E-01 %RSD)	4.39E+00	(2.00E+00 %RSD)
124	1.09E+00	(1.04E+00 %RSD)	< 1.25E-01	(N/A %RSD)	< 1.25E-01	(N/A %RSD)	1.08E+00	(1.16E+00 %RSD)
125	7.29E-01	(7.18E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	7.02E-01	(3.20E+00 %RSD)
126	1.98E+00	(1.33E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.90E+00	(7.59E-01 %RSD)
128	3.27E+00	(1.15E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	3.15E+00	(1.16E+00 %RSD)
130	3.50E+00	(3.90E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	3.42E+00	(2.05E-01 %RSD)
133	1.06E+01	(1.26E+00 %RSD)	< 5.00E-02	(N/A %RSD)	7.93E-02	(1.43E+00 %RSD)	1.06E+01	(1.57E+00 %RSD)
134	2.48E-01	(1.09E+00 %RSD)	< 5.00E-02	(N/A %RSD)	1.23E-01	(1.21E+01 %RSD)	2.52E-01	(1.21E+00 %RSD)
135	6.76E-01	(1.12E+00 %RSD)	< 1.00E-01	(N/A %RSD)	2.89E-01	(6.32E-01 %RSD)	6.83E-01	(1.06E+00 %RSD)
136	8.31E-01	(6.40E-01 %RSD)	< 1.00E-01	(N/A %RSD)	3.65E-01	(2.21E+00 %RSD)	8.24E-01	(2.75E+00 %RSD)
137	1.15E+00	(8.53E-01 %RSD)	< 1.00E-01	(N/A %RSD)	5.10E-01	(6.88E-01 %RSD)	1.15E+00	(2.24E-01 %RSD)
138	7.54E+00	(1.18E-01 %RSD)	6.06E-01	(3.31E+00 %RSD)	3.11E+00	(1.21E+00 %RSD)	7.54E+00	(1.32E+00 %RSD)
139	1.06E+01	(7.58E-01 %RSD)	< 1.00E-01	(N/A %RSD)	2.49E-01	(3.58E+00 %RSD)	1.06E+01	(1.46E+00 %RSD)
140	9.24E+00	(7.62E-01 %RSD)	< 1.50E-01	(N/A %RSD)	4.14E-01	(1.49E+00 %RSD)	9.32E+00	(8.37E-01 %RSD)
141	1.05E+01	(5.61E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.04E+01	(1.96E+00 %RSD)
142	4.02E+00	(3.15E-02 %RSD)	< 1.25E-01	(N/A %RSD)	< 1.25E-01	(N/A %RSD)	3.90E+00	(5.75E+00 %RSD)
143	1.26E+00	(1.11E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.26E+00	(1.99E+00 %RSD)
144	2.68E+00	(7.46E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.67E+00	(8.80E-01 %RSD)
145	8.58E-01	(4.08E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	8.55E-01	(1.05E+00 %RSD)
146	1.70E+00	(1.42E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.71E+00	(2.25E-01 %RSD)
147	1.50E+00	(1.13E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.49E+00	(6.79E-01 %RSD)
148	1.69E+00	(1.88E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.69E+00	(1.76E+00 %RSD)
149	1.38E+00	(4.10E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.39E+00	(7.97E-01 %RSD)
150	1.32E+00	(1.61E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.34E+00	(1.37E+00 %RSD)
151	5.03E+00	(4.00E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	5.10E+00	(7.47E-01 %RSD)
152	2.70E+00	(1.68E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.72E+00	(7.16E-01 %RSD)
153	5.52E+00	(8.05E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	5.57E+00	(2.93E+00 %RSD)
154	2.50E+00	(8.83E-02 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.51E+00	(1.10E+00 %RSD)
155	1.47E+00	(4.65E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.49E+00	(1.66E+00 %RSD)
156	2.03E+00	(2.86E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.07E+00	(6.83E-01 %RSD)
157	1.55E+00	(6.51E-02 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.57E+00	(1.29E+00 %RSD)
158	2.49E+00	(2.00E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.53E+00	(1.85E+00 %RSD)
159	1.05E+01	(8.40E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.07E+01	(9.06E-01 %RSD)
160	2.42E+00	(8.61E-03 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.43E+00	(1.33E+00 %RSD)
161	1.82E+00	(1.90E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.87E+00	(1.54E+00 %RSD)
162	2.46E+00	(5.50E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.50E+00	(1.38E+00 %RSD)
163	2.40E+00	(8.18E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.47E+00	(1.18E+00 %RSD)
164	3.03E+00	(9.68E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.96E+00	(9.58E-01 %RSD)
165	1.02E+01	(6.89E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.04E+01	(1.81E+00 %RSD)
166	3.48E+00	(1.72E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	3.56E+00	(1.17E+00 %RSD)
167	2.26E+00	(7.95E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.30E+00	(8.65E-01 %RSD)
168	2.67E+00	(7.14E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.75E+00	(9.70E-01 %RSD)
169	1.02E+01	(5.46E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.06E+01	(2.71E-01 %RSD)
170	1.76E+00	(1.36E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.81E+00	(1.50E+00 %RSD)
171	1.38E+00	(6.85E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.42E+00	(1.48E+00 %RSD)
172	2.11E+00	(9.00E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.17E+00	(7.40E-01 %RSD)
173	1.54E+00	(1.01E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.61E+00	(1.48E+00 %RSD)
174	3.24E+00	(5.07E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	3.37E+00	(1.49E+00 %RSD)
175	9.92E+00	(7.01E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.02E+01	(1.58E+00 %RSD)
176	1.97E+00	(2.56E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.02E+00	(1.55E+00 %RSD)
177	1.77E+00	(9.61E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.75E+00	(7.51E-01 %RSD)
178	2.70E+00	(5.37E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	2.59E+00	(2.05E-01 %RSD)
179	1.29E+00	(8.92E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.28E+00	(5.19E-02 %RSD)

m/z	Opening Check Standard (ug/L)	--	300311195 ADS GENERATED BLANK 2 X ug/filter	--	300311196 300311164_D(#2_311040) 2 X ug/filter	--	300311197 300311170_D(#7_311045) 2 X ug/filter	--	300311198 300311188_D(#11_311049) 2 X ug/filter	--	Closing Check Standard (ug/L)	--
51	1.01E+01	(1.85E-01 %RSD)	< 5.00E-01	(N/A %RSD)	< 5.00E-01	(N/A %RSD)	< 5.00E-01	(N/A %RSD)	5.26E-01	(5.55E+00 %RSD)	1.00E+01	(2.33E-01 %RSD)
59	1.05E+01	(2.48E+00 %RSD)	1.62E+00	(1.42E+00 %RSD)	1.67E+00	(7.65E-01 %RSD)	1.19E+00	(1.64E+00 %RSD)	1.32E+00	(6.28E-01 %RSD)	1.02E+01	(2.17E-01 %RSD)
69	6.16E+00	(2.48E-01 %RSD)	< 8.00E-01	(N/A %RSD)	3.89E+00	(2.67E-01 %RSD)	3.09E+00	(1.03E+00 %RSD)	3.14E+00	(4.94E-01 %RSD)	5.98E+00	(1.70E-01 %RSD)
71	4.12E+00	(4.24E-02 %RSD)	< 2.00E-02	(N/A %RSD)	3.02E+00	(1.05E+00 %RSD)	2.29E+00	(2.74E-01 %RSD)	2.37E+00	(1.08E+00 %RSD)	3.99E+00	(8.09E-03 %RSD)
78	2.47E+00	(3.45E+00 %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	2.44E+00	(2.75E-01 %RSD)
84	5.90E-02	(2.42E+00 %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	5.54E-02	(2.11E+00 %RSD)
85	7.41E+00	(1.12E+00 %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	7.25E+00	(7.66E-01 %RSD)
86	1.01E+00	(7.89E-01 %RSD)	< 1.00E-01	(N/A %RSD)	< 1.00E-01	(N/A %RSD)	< 1.00E-01	(N/A %RSD)	< 1.00E-01	(N/A %RSD)	1.02E+00	(1.39E+00 %RSD)
87	3.56E+00	(1.83E+00 %RSD)	< 8.00E-02	(N/A %RSD)	1.43E-01	(4.07E+00 %RSD)	1.42E-01	(1.74E+00 %RSD)	1.54E-01	(6.80E+00 %RSD)	3.50E+00	(4.18E-01 %RSD)
88	8.36E+00	(3.51E-01 %RSD)	2.65E-01	(1.93E+00 %RSD)	3.57E-01	(3.26E+00 %RSD)	6.34E-01	(1.90E+00 %RSD)	6.75E-01	(2.06E+00 %RSD)	8.22E+00	(1.17E-01 %RSD)
89	1.02E+01	(6.38E-01 %RSD)	< 4.00E-02	(N/A %RSD)	1.72E-01	(1.82E+00 %RSD)	1.55E-01	(2.20E+00 %RSD)	1.77E-01	(2.34E-01 %RSD)	1.01E+01	(1.00E-01 %RSD)
90	5.04E+00	(3.15E-01 %RSD)	< 8.00E-01	(N/A %RSD)	< 8.00E-01	(N/A %RSD)	< 8.00E-01	(N/A %RSD)	< 8.00E-01	(N/A %RSD)	4.78E+00	(8.87E-01 %RSD)
91	1.15E+00	(5.98E-01 %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	1.07E+00	(1.13E+00 %RSD)
92	3.20E+00	(5.12E-01 %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	3.08E+00	(8.74E-01 %RSD)
93	1.05E+01	(1.22E+00 %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	1.07E+01	(2.78E-02 %RSD)
94	2.67E+00	(9.28E-02 %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	2.58E+00	(1.24E+00 %RSD)
95	1.63E+00	(5.13E-01 %RSD)	< 2.50E-01	(N/A %RSD)	< 2.50E-01	(N/A %RSD)	< 2.50E-01	(N/A %RSD)	< 2.50E-01	(N/A %RSD)	1.63E+00	(4.90E-01 %RSD)
96	2.55E+00	(3.40E-02 %RSD)	< 2.50E-01	(N/A %RSD)	< 2.50E-01	(N/A %RSD)	< 2.50E-01	(N/A %RSD)	< 2.50E-01	(N/A %RSD)	2.55E+00	(3.74E-01 %RSD)
97	9.88E-01	(1.28E+00 %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	9.86E-01	(3.76E-01 %RSD)
98	2.66E+00	(4.85E-01 %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	< 4.00E-01	(N/A %RSD)	2.64E+00	(1.58E-01 %RSD)
99	1.30E+00	(1.44E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.35E+00	(6.90E-02 %RSD)
100	2.28E+00	(3.87E-01 %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	2.30E+00	(6.68E-01 %RSD)
101	1.73E+00	(1.63E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.77E+00	(7.84E-01 %RSD)
102	3.30E+00	(3.88E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	3.39E+00	(2.23E-02 %RSD)
103	1.03E+01	(4.08E-01 %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	1.07E+01	(1.00E+00 %RSD)
104	3.03E+00	(1.37E-01 %RSD)	< 3.00E-01	(N/A %RSD)	< 3.00E-01	(N/A %RSD)	< 3.00E-01	(N/A %RSD)	< 3.00E-01	(N/A %RSD)	3.09E+00	(1.52E-01 %RSD)
105	2.28E+00	(6.58E-01 %RSD)	< 5.00E-01	(N/A %RSD)	< 5.00E-01	(N/A %RSD)	< 5.00E-01	(N/A %RSD)	< 5.00E-01	(N/A %RSD)	2.28E+00	(5.37E-01 %RSD)
106	2.94E+00	(5.87E-01 %RSD)	< 6.00E-01	(N/A %RSD)	< 6.00E-01	(N/A %RSD)	< 6.00E-01	(N/A %RSD)	< 6.00E-01	(N/A %RSD)	2.97E+00	(2.75E-01 %RSD)
107	5.45E+00	(2.77E-01 %RSD)	1.33E+00	(2.51E+01 %RSD)	7.73E-01	(2.26E+01 %RSD)	1.17E+00	(5.68E+01 %RSD)	9.34E-01	(4.88E+01 %RSD)	4.55E+00	(4.76E+00 %RSD)
108	2.77E+00	(5.61E-01 %RSD)	< 6.00E-01	(N/A %RSD)	< 6.00E-01	(N/A %RSD)	< 6.00E-01	(N/A %RSD)	< 6.00E-01	(N/A %RSD)	2.81E+00	(4.15E-01 %RSD)
109	5.05E+00	(1.01E+00 %RSD)	1.22E+00	(2.53E+01 %RSD)	7.19E-01	(2.46E+01 %RSD)	1.08E+00	(5.67E+01 %RSD)	8.73E-01	(4.99E+01 %RSD)	4.16E+00	(3.86E+00 %RSD)
110	2.45E+00	(2.64E-01 %RSD)	< 3.00E-01	(N/A %RSD)	7.14E-01	(1.73E+00 %RSD)	6.39E-01	(4.67E+00 %RSD)	7.00E-01	(1.95E+00 %RSD)	2.48E+00	(3.26E-02 %RSD)
111	1.32E+00	(2.25E-01 %RSD)	< 2.00E-02	(N/A %RSD)	6.52E-01	(2.91E+00 %RSD)	5.38E-01	(5.66E-01 %RSD)	5.94E-01	(7.53E-01 %RSD)	1.34E+00	(1.28E+00 %RSD)
112	2.57E+00	(9.75E-01 %RSD)	< 2.00E-02	(N/A %RSD)	1.25E+00	(6.52E-02 %RSD)	9.96E-01	(5.87E-01 %RSD)	1.14E+00	(1.18E+00 %RSD)	2.58E+00	(5.01E-01 %RSD)
113	1.39E+00	(5.86E-01 %RSD)	< 2.00E-02	(N/A %RSD)	6.91E-01	(2.74E-01 %RSD)	5.83E-01	(1.24E+00 %RSD)	6.26E-01	(4.96E-01 %RSD)	1.39E+00	(8.30E-01 %RSD)
114	2.97E+00	(9.88E-01 %RSD)	< 2.00E-02	(N/A %RSD)	1.46E+00	(1.45E+00 %RSD)	1.17E+00	(1.50E+00 %RSD)	1.32E+00	(8.28E-01 %RSD)	3.00E+00	(1.79E-01 %RSD)
116	2.21E+00	(6.52E-01 %RSD)	< 8.00E-02	(N/A %RSD)	3.76E-01	(1.73E-01 %RSD)	3.11E-01	(6.67E-01 %RSD)	3.66E-01	(3.00E+00 %RSD)	2.23E+00	(4.07E-01 %RSD)
117	7.96E-01	(1.04E-01 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	7.96E-01	(1.16E-01 %RSD)
118	2.46E+00	(4.07E-01 %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	2.46E+00	(7.57E-02 %RSD)
119	8.88E-01	(8.41E-03 %RSD)	< 4.00E-02	(N/A %RSD)	1.17E-01	(2.68E+00 %RSD)	9.99E-02	(6.18E+00 %RSD)	1.11E-01	(2.26E+00 %RSD)	8.89E-01	(4.28E-01 %RSD)
120	3.33E+00	(4.96E-01 %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	3.32E+00	(1.27E-01 %RSD)
121	5.78E+00	(2.52E-01 %RSD)	5.17E+00	(2.77E+00 %RSD)	6.14E+00	(1.05E+00 %RSD)	3.90E+00	(6.51E-01 %RSD)	4.19E+00	(1.66E+00 %RSD)	5.63E+00	(1.12E+00 %RSD)
122	7.40E-01	(1.11E+00 %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	7.41E-01	(7.18E-01 %RSD)
123	4.51E+00	(1.41E-03 %RSD)	4.05E+00	(2.25E+00 %RSD)	4.76E+00	(4.09E-01 %RSD)	3.05E+00	(2.28E-01 %RSD)	3.21E+00	(2.24E+00 %RSD)	4.38E+00	(1.35E+00 %RSD)
124	1.08E+00	(1.02E+00 %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	1.09E+00	(2.87E-01 %RSD)
125	7.51E-01	(3.48E+00 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	6.73E-01	(1.44E+00 %RSD)
126	1.96E+00	(2.20E+00 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.86E+00	(1.62E+00 %RSD)
128	3.32E+00	(6.71E-01 %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	3.16E+00	(4.74E-01 %RSD)
130	3.57E+00	(1.07E-01 %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	3.49E+00	(9.69E-01 %RSD)
133	1.06E+01	(5.99E-01 %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	1.03E+01	(5.53E-01 %RSD)
134	2.58E-01	(8.83E-01 %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	2.47E-01	(1.86E-02 %RSD)
135	6.72E-01	(1.54E-02 %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	6.74E-01	(7.91E-01 %RSD)
136	8.28E-01	(1.37E+00 %RSD)	< 1.50E-01	(N/A %RSD)	< 1.50E-01	(N/A %RSD)	< 1.50E-01	(N/A %RSD)	< 1.50E-01	(N/A %RSD)	8.87E-01	(3.42E-01 %RSD)
137	1.15E+00	(1.68E-02 %RSD)	< 1.50E-01	(N/A %RSD)	< 1.50E-01	(N/A %RSD)	< 1.50E-01	(N/A %RSD)	< 1.50E-01	(N/A %RSD)	1.15E+00	(1.45E+00 %RSD)
138	7.44E+00	(8.52E-01 %RSD)	< 8.00E-01	(N/A %RSD)	< 8.00E-01	(N/A %RSD)	< 8.00E-01	(N/A %RSD)	< 8.00E-01	(N/A %RSD)	7.68E+00	(6.81E-01 %RSD)
139	1.05E+01	(3.93E-01 %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	1.08E+01	(7.35E-01 %RSD)
140	9.18E+00	(1.44E-01 %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	9.51E+00	(4.30E-02 %RSD)
141	1.04E+01	(1.60E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.07E+01	(5.29E-02 %RSD)
142	3.92E+00	(2.80E-01 %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	3.86E+00	(7.81E-01 %RSD)
143	1.26E+00	(3.53E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.29E+00	(3.45E-01 %RSD)
144	2.69E+00	(1.10E+00 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.75E+00	(6.64E-01 %RSD)
145	8.56E-01	(1.99E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	8.75E-01	(7.09E-01 %RSD)
146	1.72E+00	(6.94E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.74E+00	(4.85E-01 %RSD)
147	1.49E+00	(2.80E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.51E+00	(3.28E-01 %RSD)
148	1.69E+00	(8.45E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.73E+00	(2.98E-01 %RSD)
149	1.41E+00	(4.75E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.45E+00	(3.24E-01 %RSD)
150	1.33E+00	(8.42E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.36E+00	(9.96E-02 %RSD)
151	4.95E+00	(4.81E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	5.17E+00	(5.38E-01 %RSD)
152	2.69E+00	(1.55E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.78E+00	(2.94E-01 %RSD)
153	5.46E+00	(5.56E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	5.71E+00	(2.92E-01 %RSD)
154	2.53E+00	(1.43E-02 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.55E+00	(1.42E-01 %RSD)
155	1.47E+00	(2.69E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.53E+00	(3.61E-01 %RSD)
156	2.07E+00	(2.44E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.12E+00	(2.81E-02 %RSD)
157	1.55E+00	(1.04E+00 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.60E+00	(3.98E-01 %RSD)
158	2.49E+00	(6.86E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.57E+00	(4.88E-01 %RSD)
159	1.04E+01	(1.77E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.10E+01	(4.40E-01 %RSD)
160	2.40E+00	(3.70E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.50E+00	(1.47E-01 %RSD)
161	1.85E+00	(1.02E+00 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.76E+00	(1.53E+00 %RSD)
162	2.52E+00	(1.09E+00 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.39E+00	(2.80E+00 %RSD)
163	2.44E+00	(7.82E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.32E+00	(1.34E+00 %RSD)
164	2.97E+00	(5.21E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.78E+00	(1.05E+00 %RSD)
165	1.02E+01	(1.01E+00 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	9.80E+00	(1.19E+00 %RSD)
166	3.45E+00	(1.76E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	3.22E+00	(1.85E+00 %RSD)
167	2.27E+00	(4.05E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.14E+00	(1.75E+00 %RSD)
168	2.72E+00	(5.85E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.58E+00	(2.89E+00 %RSD)
169	1.03E+01	(6.38E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	9.89E+00	(2.47E+00 %RSD)
170	1.79E+00	(3.11E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.70E+00	(2.36E+00 %RSD)
171	1.41E+00	(4.82E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.34E+00	(3.01E+00 %RSD)
172	2.16E+00	(8.46E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.06E+00	(2.86E+00 %RSD)
173	1.57E+00	(9.42E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.50E+00	(2.59E+00 %RSD)
174	3.24E+00	(9.08E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	3.09E+00	(1.56E+00 %RSD)
175	9.99E+00	(6.37E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	9.64E+00	(2.40E+00 %RSD)
176	2.03E+00	(5.87E-02 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	1.92E+00	(2.89E+00 %RSD)
177	1.81E+00	(1.15E+00 %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	1.61E+00	(1.33E+00 %RSD)
178	2.66E+00	(7.38E-01 %RSD)	< 1.00E-01	(N/A %RSD)	< 1.00E-01	(N/A %RSD)	< 1.00E-01	(N/A %RSD)	< 1.00E-01	(N/A %RSD)	2.40E+00	(1.17E+00 %RSD)
179	1.33E+00	(1.31E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	1.18E+00	(2.34E+00 %RSD)
180	3.61E+00	(3.49E-01 %RSD)	< 1.50E-01	(N/A %RSD)	< 1.50E-01	(N/A %RSD)	< 1.50E-01	(N/A %RSD)	< 1.50E-01	(N/A %RSD)	3.17E+00	(1.15E+00 %RSD)
181	1.03E+01	(1.31E-01 %RSD)	< 3.00E-01	(N/A %RSD)	< 3.00E-01	(N/A %RSD)	< 3.00E-01	(N/A %RSD)	< 3.00E-01	(N/A %RSD)	1.00E+01	(2.20E+00 %RSD)
182	2.60E+00	(1.35E+00 %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	< 6.00E-02	(N/A %RSD)	2.43E+00	(9.34E-01 %RSD)
183	1.40E+00	(1.27E+00 %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	< 4.00E-02	(N/A %RSD)	1.31E+00	(1.53E+00 %RSD)
184	3.17E+00	(9.07E-01 %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	2.81E+00	(1.86E+00 %RSD)
185	3.78E+00	(8.23E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	3.78E+00	(2.27E+00 %RSD)
186	3.10E+00	(1.25E+00 %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	< 8.00E-02	(N/A %RSD)	2.78E+00	(2.23E+00 %RSD)
187	6.57E+00	(1.03E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	6.40E+00	(3.50E+00 %RSD)
191	3.82E+00	(2.75E-02 %RSD)	< 1.00E-01	(N/A %RSD)	< 1.00E-01	(N/A %RSD)	< 1.00E-01	(N/A %RSD)	< 1.00E-01	(N/A %RSD)	3.49E+00	(2.58E+00 %RSD)
193	6.46E+00	(9.48E-03 %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	6.24E+00	(2.14E+00 %RSD)
194	3.27E+00	(1.05E+00 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	3.12E+00	(2.49E+00 %RSD)
195	3.37E+00	(8.05E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	3.22E+00	(1.39E+00 %RSD)
196	2.50E+00	(6.06E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.38E+00	(1.28E+00 %RSD)
198	7.27E-01	(1.39E+00 %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	< 2.00E-01	(N/A %RSD)	6.97E-01	(2.06E+00 %RSD)
203	2.95E+00	(6.70E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	2.78E+00	(1.27E+00 %RSD)
204	1.43E-01	(7.08E-01 %RSD)	< 8.00E-02	(N/A %RSD)	1.29E+01	(1.24E+00 %RSD)	9.47E+00	(2.55E-01 %RSD)	9.40E+00	(2.02E+00 %RSD)	1.39E-01	(1.17E+00 %RSD)
205	7.30E+00	(3.80E-01 %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	7.10E+00	(1.86E+00 %RSD)
206	2.38E+00	(7.23E-02 %RSD)	< 1.50E-01	(N/A %RSD)	2.44E+02	(7.54E-01 %RSD)	1.82E+02	(1.24E+00 %RSD)	1.78E+02	(1.30E+00 %RSD)	2.28E+00	(2.16E+00 %RSD)
207	2.15E+00	(3.66E-01 %RSD)	< 1.50E-01	(N/A %RSD)	2.09E+02	(1.60E+00 %RSD)	1.55E+02	(2.73E-01 %RSD)	1.51E+02	(1.78E+00 %RSD)	2.04E+00	(1.99E+00 %RSD)
208	5.40E+00	(6.85E-02 %RSD)	< 4.00E-01	(N/A %RSD)	5.05E+02	(4.88E-01 %RSD)	3.75E+02	(1.17E-01 %RSD)	3.65E+02	(1.05E+00 %RSD)	5.33E+00	(1.96E+00 %RSD)
230			< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)		
232	1.01E+01	(1.16E+00 %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	< 5.00E-02	(N/A %RSD)	9.69E+00	(2.42E+00 %RSD)
233			< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)	< 2.00E-02	(N/A %RSD)		

Experimental

Each sample was diluted in 2% nitric acid and spiked with internal standard. 300311090-092 and 300311129-130 were diluted 100x and 25x; 300311195-198 were diluted 100x and 10x. The samples were then analyzed on the instrument following calibration of standards in the same acid/internal standard matrix.

ICPMS was employed to measure concentrations at atomic masses to identify elemental composition in the samples. Analysis was carried out in Building 773A, Laboratory B142 on an Agilent 7700x ICPMS, equipped with a He gas collision cell for polyatomic interference discrimination. The mass spectrometer was mass calibrated and tuned before analysis.

Attachment 7

Semivolatile Organic Compound analysis (SVOC)

Sample ID

ADS No.	Customer ID
300311110	FAS Filter 300311038-E
300311165	CAM Filter#2 (311040)-E
300311171	CAM Filter#7 (311045)-E
300311189	CAM Filter#11 (311049)-E

Discussion of Results

Four samples were submitted for semivolatile organic compound (SVOC) analysis. The samples contained long chain hydrocarbons with a boiling point range of 330 to 490+ degrees Celsius. The hydrocarbons were possibly functionalized as alcohols, olefins, carboxylic esters, or polyfluorinated compounds. Cumulative quantification is tabulated for these findings in Table 1.

Organic nitrates were not present in any samples, as determined by lack of characteristic [O-N-O]+ ion fragments.

The analytes identified may be artifacts of reactive gas interactions with the Rados (R) filter material. The analytes may be waste constituents or products of the melted polymer from the magnesium oxide bags (consistent with visual observation of bag melt).

The Rados (R) filter material is not adsorptive to organics, and the organic analytes captured may not be representative of analytes present in the air samples.

Table 1. Cumulative Analyte found on Filter Material

Sample ID	**Material, mg/filter**
FAS Filter 300311038-E	2.1
CAM Filter#2 (311040)-E	0.79
CAM Filter#7 (311045)-E	0.97
CAM Filter#11 (311049)-E	0.84

The sample chromatograms appear to be different in comparing the CAM samples to the FAS. Refer to the overlay of chromatograms presented in Figure 1. The bottom trace represents the FAS sample, and the top three are from the CAM samples.

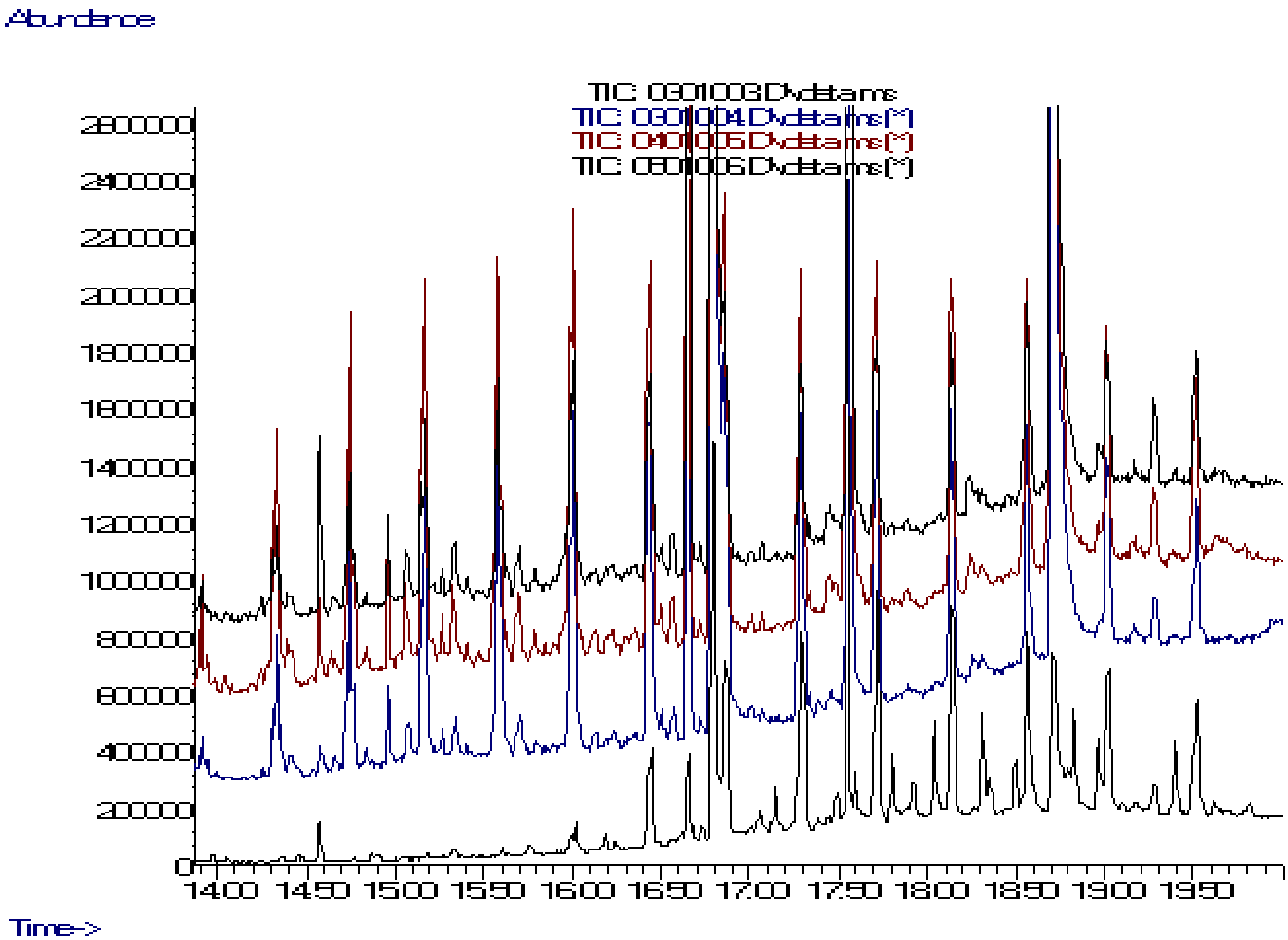


Figure 1. Overlay of the Chromatograms. Bottom is from FAS and top three are from CAM.

Experimental

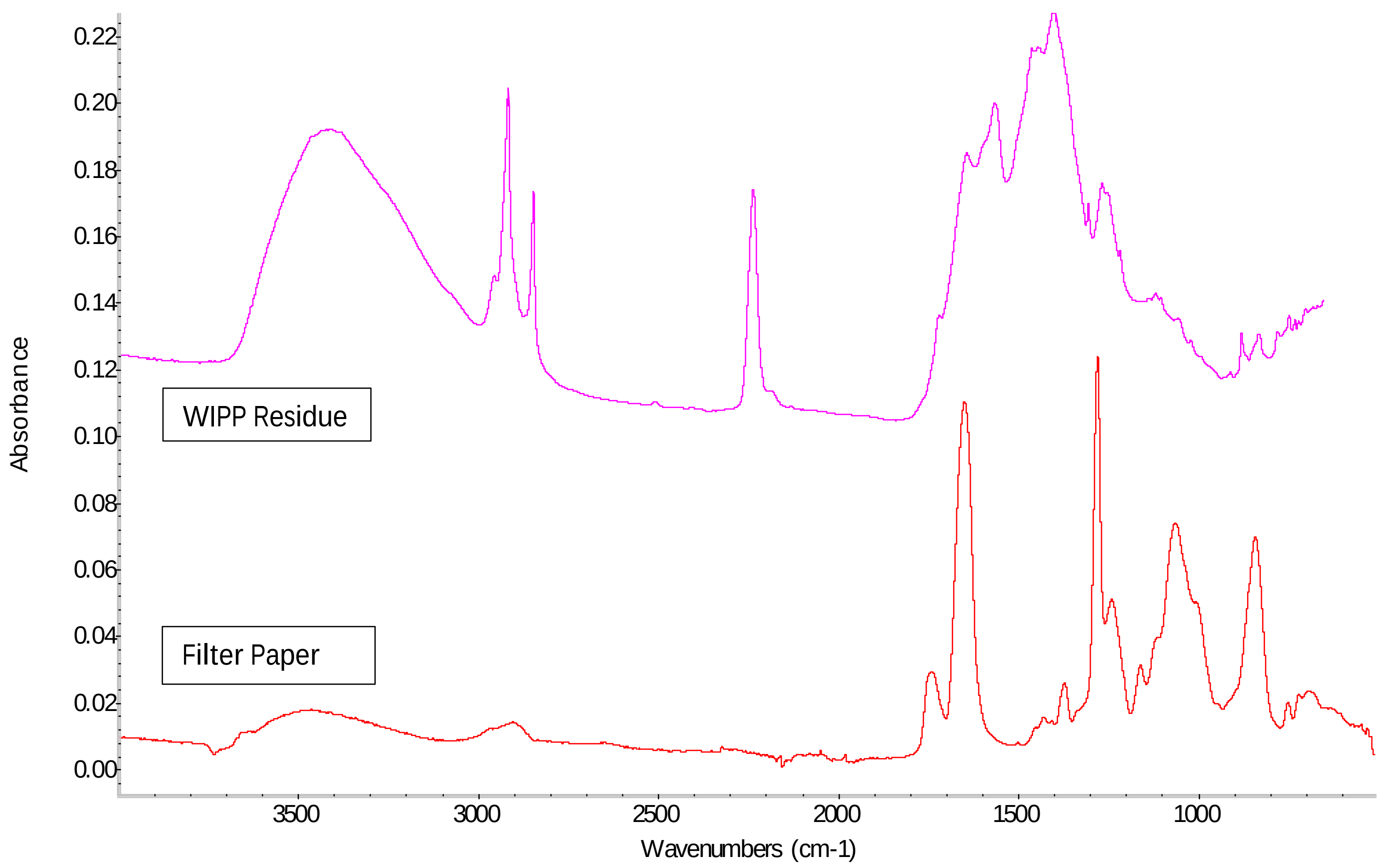
Each filter sample was weighed then extracted three times with methylene chloride. The filters were then dried and weighed to quantify the amount of material extracted. Each extract was concentrated to one mL, spiked with internal standard, then analyzed by GC/MS.

Gas Chromatography / Mass Spectrometry (GC/MS) analysis was employed to identify organic compounds in the samples. Analyses were carried out in Building 773A, Laboratory B123. Analytical separations were carried out on an Agilent 6890 gas chromatograph, equipped with a 25 m DB-5MS column, with 0.20 mm diameter and 0.33 um film thickness. Quantitation was performed using an Agilent 5973 mass selective detector. The mass spectrometer tuning was confirmed within 24 hours prior to each measurement using perfluorotributylamine.

Attachment 8

Fourier Transform Infrared (FTIR) analysis

Analysis of particles from a CAM sample showed a variety of functional groups. Bands were observed resulting from a hydroxide group, alkane group, nitrile group, and carbonyl group indicating the presence of organic compounds. Additionally, bands were observed in the region where nitro groups occur. Since this sample contains a mixture of organic and inorganic compounds that contain overlapping bands, further sample preparation is required to obtain clear peak assignments of nitrated compounds. Manual peak assignments of the spectrum suggest nitro functional groups may be present in the sample but it is not definitive.



Attachment 9

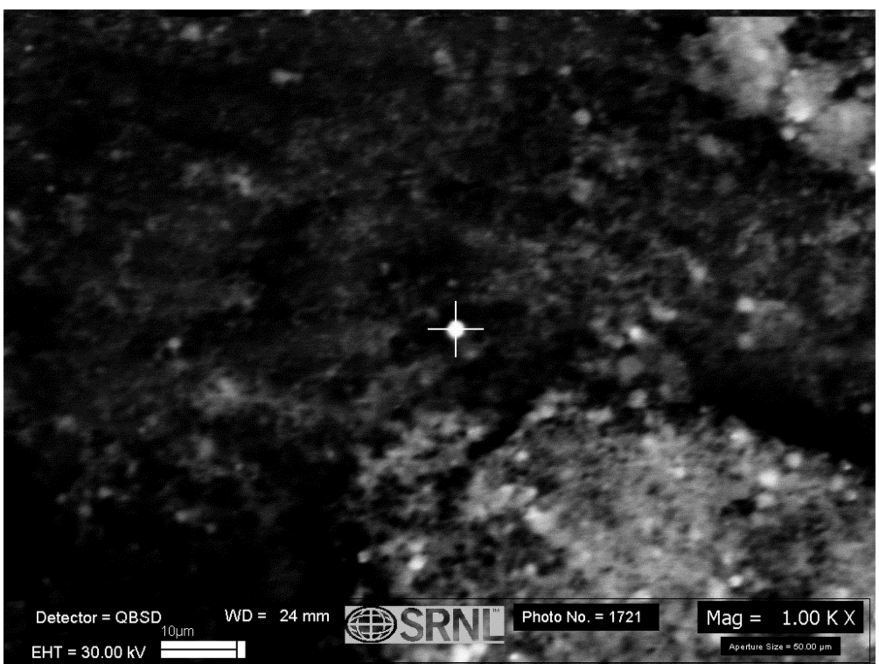
X-Ray Diffraction (XRD)

The X-ray diffraction Laboratory of the Savannah River National laboratory ran three Waste Isolation Pilot Plant (WIPP) CAM filter samples. The material was scrapped off the CAM filter and a mixture of 10% Collodion/Amyl Acetate was used to adhere the solids to a 2" by 2" piece of plate glass. The samples were run on the contained Bruker x-ray diffraction instrument with a 2• range of 5 to 70°, a step size of 0.02°, and a dwell time of 1 second. Sodium chloride was found in all three CAM filter samples. This is a qualitative measurement, can only verify the presence of the mineral.

Attachment 10

Scanning Electron Microscopy (SEM)

Three CAM filter samples were examined by a scanning electron microscope (SEM) equipped with energy dispersive spectroscopy (EDS). Generally, the results were similar, with the predominant filter cake material being containing sodium, chlorine, magnesium, potassium, and lead. Lead was present as well in approximately 1-10 micron diameter (as well as smaller submicron particles) lead-rich particles with very bright contrast in backscatter SEM images as shown below in the center of the image with a cross superimposed on it. Note that although there are other fairly bright particles in the image below, they are not necessarily lead-rich. Due to the large background presence of lead, sulfur was excluded in the EDS analysis as lead is a major interferent with sulfur in EDS. The signal to noise ratio generally was poor enough as to not definitively include sulfur. Other particles containing iron were found as well, 20-25 microns in diameter in CAM 11 samples, as well as one about 2 microns in diameter. These could be due to sample preparation. The samples were coated with carbon to reduce charging.



Attachment 11

X-Ray Fluorescence (XRF)

A portion of a CAM filter from the WIPP facility was measured using a custom designed x-ray fluorescence spectrometer.

Spectrometer components are:

1. Amptek 123SDD x-ray spectrometer (serial # 010171)
2. Amptek Mini-X Ag target x-ray tube (Serial # 11-18913)
3. SRNL designed sample chamber for radioactive samples

The sample, designation Young-311111, is approximately 1/8 of a Whatman air filter from a CAM located within the WIPP facility. The sample was packaged in a polycarbonate ring (2"OD x 1.25" ID x 0.0625" thick) covered on each side with 4um thick ultralene film, held to the disk with double back adhesive. The packaged sample was further contained in a plastic bag which was taped closed. A blank filter sample was prepared in the same way as the sample.

The x-ray spectrometer parameters used for all acquisitions were:

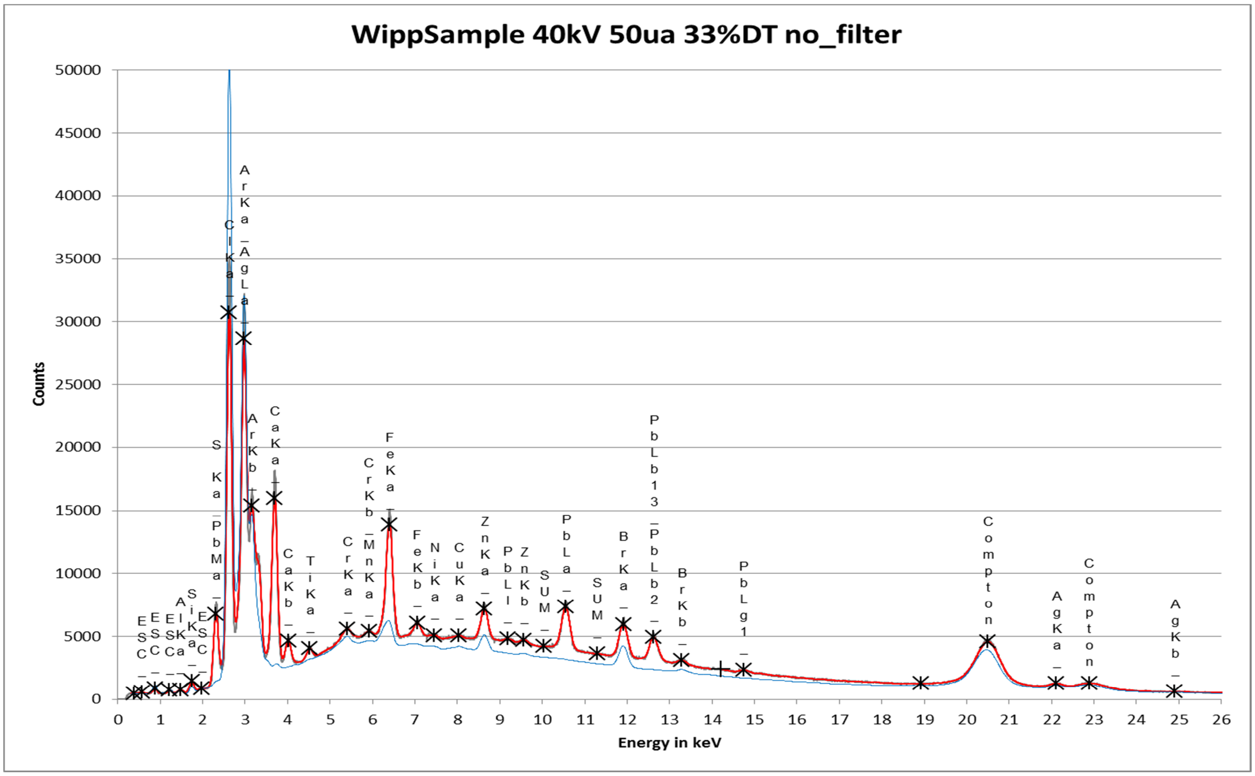
1. Gain = 50
2. Rise time = 4.8us
3. Slow threshold = 40
4. Fast threshold = 19
5. Number of channels = 4096
6. Acquisition time = 600 sec
7. High voltage = -75V
8. Detector temperature = 233^{o}K
9. Detector energy slope calibration = .0065904 keV/ch
10. Detector energy offset calibration = -0.07581 keV
    (energy calibration from two peak centroid method using AgLa and AgKa lines)

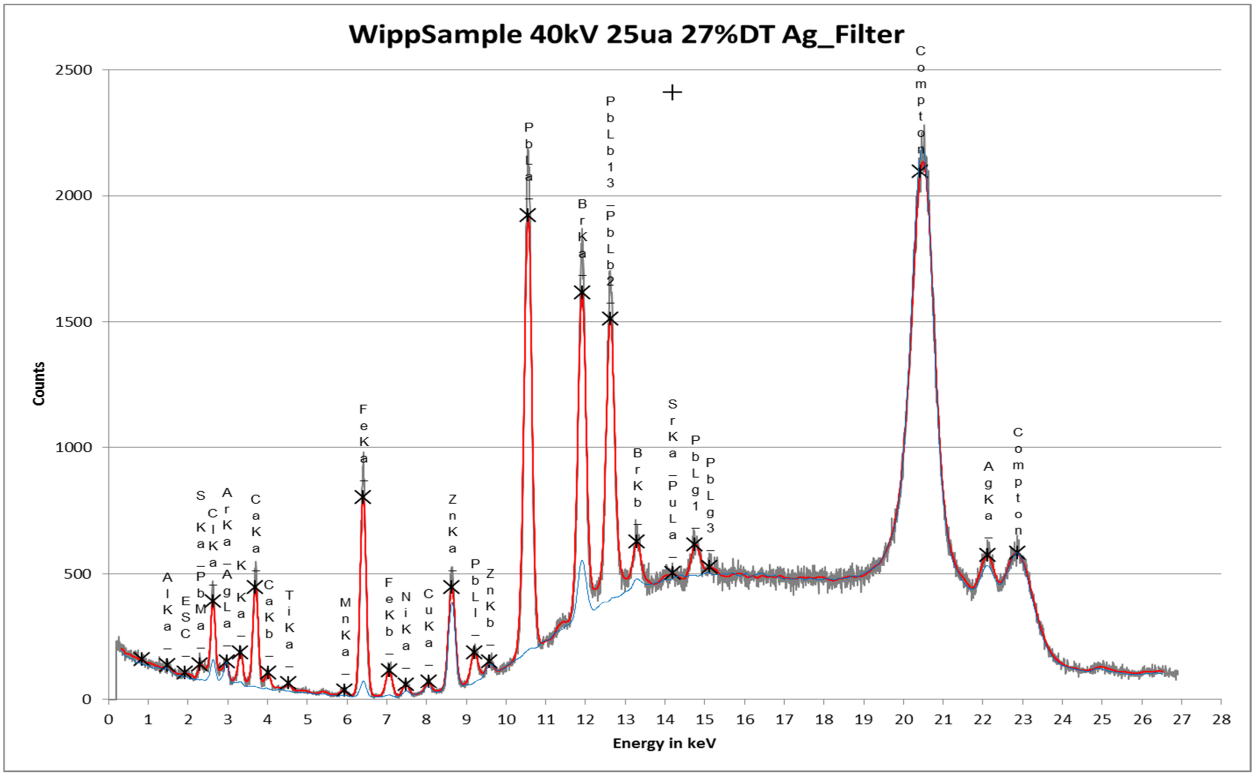
The bagged and packaged sample was placed into the sample chamber and irradiated by the x-ray tube under three conditions:

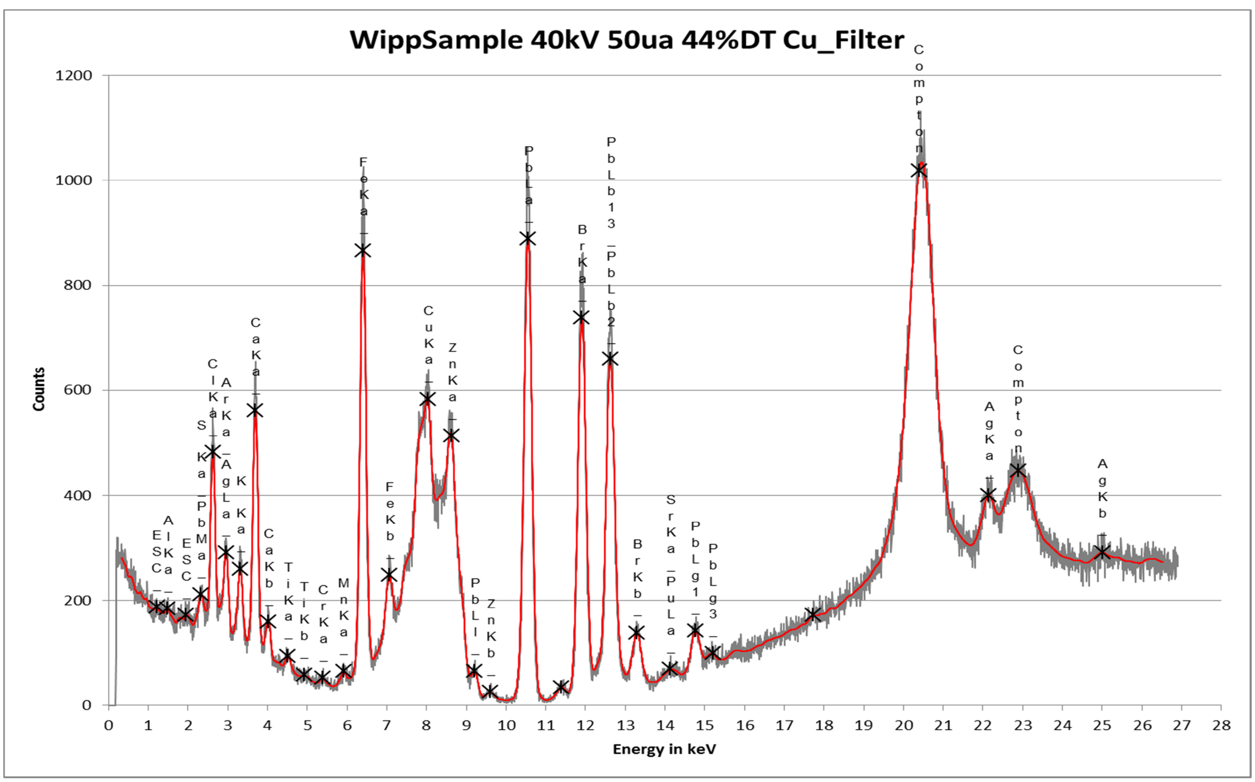
1. 40kV, 50 microamps, no filter. This resulted in a detector dead-time of 33%, and a fast count-rate of 32,000 cps. The sample and blank data can be found in spreadsheet WippSample2.xlsx. Figure 1 shows the sample and blank spectra under these conditions. Elements identified in the sample are:
    Al, Si, S, Cl, K, Ca, Ti, Cr, Mn, Fe, Ni, Cu, Zn, Br, and Pb.
    Also shown in the spectra are Ag (from the x-ray tube) and Ar (from air)
    This XRF is not sensitive to elements less than atomic # 13 (H to Mg).

2. 40kV, 25 microamps, 25 um thick Ag_filter. This resulted in a detector dead-time of 27%, and a fast count-rate of 3500 cps. The sample and blank data can be found in spreadsheet WippSample4.xlsx. Figure 2 shows the sample and blank spectra under these conditions. Elements identified in the sample are the same as before with the addition of a peak indicative of either Sr or Pu @ 14.2kV.

3. 40kV, 50 microamps, 50 um thick Cu_filter. This resulted in a detector dead-time of 44%, and a fast count-rate of 2900 cps. The sample data can be found in spreadsheet WippSampleCu_filter.xlsx. Figure 3 shows the sample spectrum under these conditions. No additional elements were identified under these conditions.




WippSample 40kV 25ua 27%DT Ag_Filter
Counts
0
500
1000
1500
2000
2500
Energy in keV
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28


WippSample 40kV 50ua 44%DT Cu_Filter
Counts
0
200
400
600
800
1000
1200
Energy in keV
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

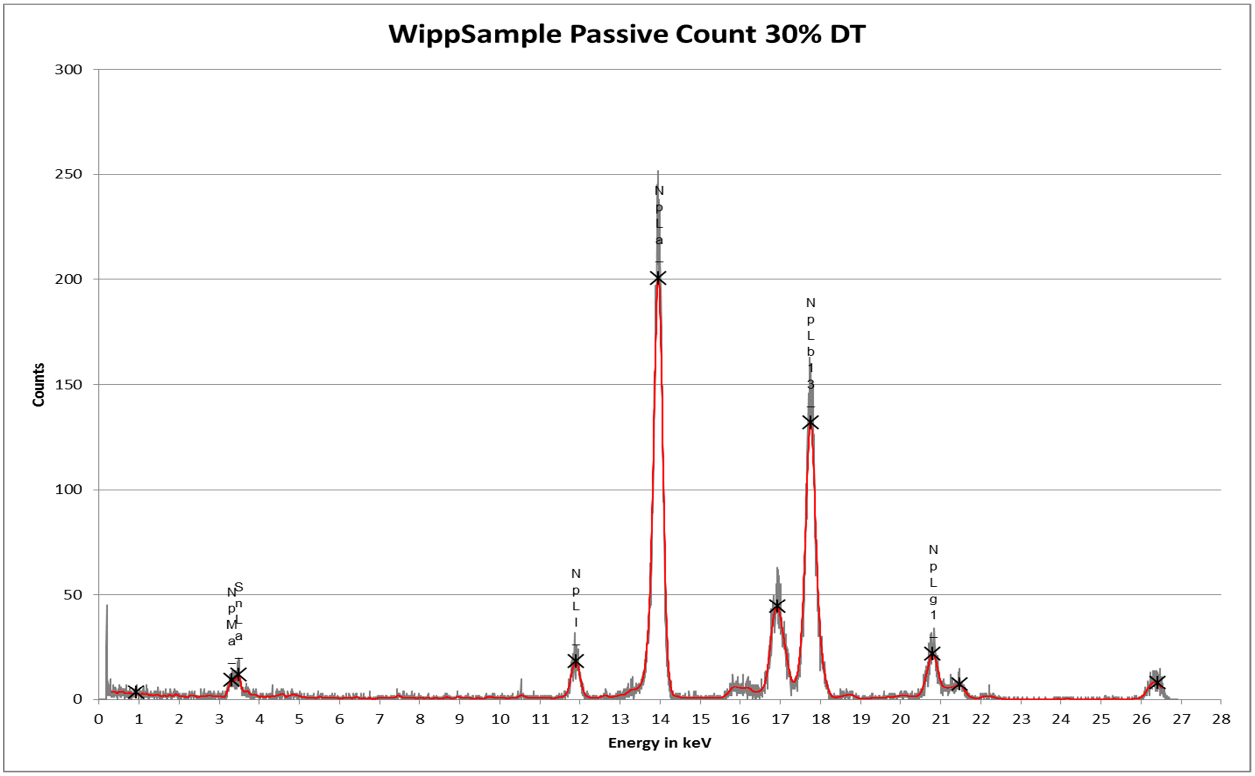


Figure 4 shows a passive count of the sample with the x-ray spectrometer pressed up to the outer plastic bag to maximize collection efficiency. The Np x-rays observed are a result of Am alpha decay.

The XRF spectra were processed using Excel macro programs in file Amptek_XRF_Data.xls. as follows:

- Setup_XRF (<Ctrl-A>) – reads energy calibration and populates processing parameters with default values.
- Convolve (<Ctrl-B>) – Computes smoothed, first derivative and second derivative spectra from raw counts using an adaptive Gaussian filter.
- PlotData (<Ctrl-C>) – Plots raw, smoothed, first derivative and second derivative spectra.
- Peak_Search (<Ctrl-D>) – Finds peak energy, peak width, and peak intensity from first and second derivative data.
- MajorX (<Ctrl-E>) – Matches elements to peak locations and identifies escape and sum peaks.
- LabelPeak (<Ctrl-F>) – Labels peaks in the smoothed spectrum plot with element names.

Attachment 12

Raman Spectroscopy

A portion of a CAM filter from the WIPP facility was measured by Raman spectroscopy in an attempt to determine the identities of any molecular species collected on the filter. Raman spectroscopy is potentially sensitive to molecular anions (nitrate, nitrites, phosphates, chlorates, etc.), and under some conditions can identify carbonaceous soot.

The samples analyzed by Raman were also analyzed by x-ray fluorescence, and are as described in that report. In addition to the sample Young-311111 and a clean filter, a third sample of clean filter colored with a black marker pen was also analyzed. One concern of focusing an intense laser beam on a dark (light absorbing) sample is heat transfer and subsequent burning/volatilization/chemical degradation of the sample. The black-marked paper allowed for alignment of a sample to the instrument to allow maximum signal without burning. Also important for the Raman analysis is the fact that the samples were in a clear plastic bag for radiological containment. (The 4 micron clear ultralene film did not affect results.) The Raman laser was directed through the bag onto the sample, and thus results did include CH stretches coming from the bag polymer. However, these peaks did not overlap with the expected positions of peaks associated with molecular anions.

Two Raman spectrometers were used in the analysis. One, manufactured by Enwave Optics, consists of a 150 mW, 532 nm laser, fiber optic probe, dispersive spectrometer, and cooled diode array detector. The other, manufactured by Ahura Scientific, used a 30 mW, 785 nm laser and did not have a fiber probe. The 785 nm instrument was used in an attempt to reduce large background signals observed with the 532 nm instrument.

In summary, only negative results were obtained with either instrument. Large background signals, likely due to fluorescence or nonspecific emission from the dirt or soot in the filter, masked any scattering due to molecular anions. Furthermore, the dark color of the solids on the filter precluded obtaining signal from any part of the sample below the surface, thus reducing the sensitivity of the method. As noted above, small peaks were seen that corresponded to scattering from the protective bag at ~3000 cm-1. This identification was confirmed by observation of the same peaks for the clean filter, similarly bagged, and for analysis of a part of the sample bag where the laser did not hit the filter. Note that the filter section was only about half the size of the polycarbonate ring holder. Therefore, we are unable to provide any information about the filter solids by this method.

Attachment 13

Visual Observation of Filter Papers from FAS-118 and CAM-151

Filter	Description
FAS-118	Black-charcoal color – back side of the filter was white
CAM-151	
1	Brown – back side of filter is white with black ring partially around the perimeter the perimeter of the filter paper
2	Charcoal-black color. The back side of the filter was white with a small smear of black
3	Black in color. The filter was deformed and appears to have cracking of the back layer exposing some of the filter beneath the black layer. Deformation from the back of the filter is obvious. Filter is pushed out from back.
4	Black uniform color except for areas that seem scored and expose the filter paper. There seems to be a thin layer of "crust" of black on the filter.
5	Brownish-gray more uniform. May have a lighter color particulate collected with the dark material.
6	Charcoal brown in color uniformly distributed,
7	Charcoal brown in color. Similar in color to Filter #6.
8	Charcoal brown in color. Similar in color to Filter #6 and 7.
9	Charcoal brown in color. Similar in color to Filter #6, 7 and 8.
10	More brown in color. Some charcoal color nonuniformly distributed with some area of the filter lighter in color. There is one score mark'
11	Charcoal brown in color. Similar to 6,7,8 and 9. Uniform distribution of material.
12	Very clear light brown color. No "caking" of material. Appears to have a very light material load.
13	No filter paper is present. There was no evidence of the missing paper in the cartridge.
14	Filter paper is white. Appears to be clean but deformed on one side from front to back of paper (deformed in the opposite direction of the 3rd filter.
15	Mostly white paper. Small area in the center of the filter is non-uniformly discolored. Almost like scoring lines are gray. Slight deformation of filter is evident from the back.
16	Filter is mostly white with some dark material deposited in the middle. Very light material loading but gray in color.
17	Similar to the 16 but less coloring and material is present. Slight dark spot on the back of the filter but the back of the cartridge is open and the back of the filter paper is unprotected.

The CAM-151 filter papers are numbered and described in the order in which the filter paper was removed from the cartridge. One end of the cartridge has a lip that prevents the filter paper from being placed into or out of the cartridge from that side. It is my working assumption that the CAM-151 cartridge is loaded with filter papers with the earliest filters first. This would mean that the first filter used by the cartridge is the last filter paper to be removed. Similarly, the last filer paper used by CAM-151 is the first filter paper removed from the cartridge. This would mean that the filter papers listed numerically in the table above are in reverse chronological order. Filter paper 17 would be the first filter paper used by the CAM and filter paper 1 was the last filter paper used.